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# COMPUTER USE IN SMALL U.S. FIRMS: IS THERE A DIGITAL DIVIDE?

**Susan Coleman**
University of Hartford
scoleman@mail.hartford.edu

## ABSTRACT

*This article uses data from the 1998 Survey of Small Business Finances to explore the use of computers and the Internet by small firms. Results reveal that firms owned by black men and firms owned by Asian men were significantly less likely to use computers for business purposes than firms owned by white men. There were no significant differences between firms owned by white men and those owned by white women or by Hispanic men. Other significant predictors of computer use included measures of firm size, firm age, organizational status, owner age, and the educational level of the owner.*

## INTRODUCTION

As with larger firms, the technological revolution that has occurred over the course of the last twenty years has had a powerful impact on small firms. Today, small firms can use computers and electronic commerce to reach out to current and potential customers, to streamline supplier relationships and manage inventories, to lower the cost of production, and to automate functions previously performed by hand. Through the use of technology small firms can lower their costs, reach a larger number of customers, and serve them better. Thus, they are better positioned to compete in the global marketplace. Studies conducted on behalf of the U.S. Small Business Administration have found that small firms using the Internet grow more rapidly and have higher revenues than those that do not (E-commerce: Small Businesses Venture Online, 1999; Small Business Expansions in Electronic Commerce, 2000). Further, sales via the Internet are becoming an increasingly large percentage of retail sales overall (Bakos, 2001; Borenstein & Saloner, 2001; Morton et al., 2001).

Cost, though still an impediment for very small firms, is no longer the insurmountable obstacle it might once have been. Thanks to the steadily declining cost of computer equipment, a single individual can set up a home office for less than $5,000. Further, one of the beauties of the Internet is that it makes electronic commerce affordable to even very small firms employing one or two people.

Given the potential benefits, one would anticipate that the use of technology by small firms would be practically universal, yet such is not the case. Although a number of small firms have embraced technology, there are still a number that do not use computers to conduct their businesses. Thus, there are two classes of firms, the technological haves and the have-nots,

with the have-nots being at a distinct and growing disadvantage. This article will explore the use of technology by small firms as well as some of the factors that separate small firms that are computer users from those that are not.

## PRIOR RESEARCH

The term "digital divide" emerged from a series of studies done by the U.S. Department of Commerce on household use of computers and the Internet. These studies found that certain groups had a higher level of usage than others. Specifically, they revealed that more highly educated households and higher income households were more likely to be computer and Internet users. Further, black and Hispanic households were significantly less likely to be users of the Internet (Falling Through the Net, 2000; A Nation Online, 2002).

Calvert et al. (2005) noted a socio-economic and racial divide in access to computers and use of the Internet even in early childhood. In a study conducted by the Henry J. Kaiser Family Foundation, they found that families with higher incomes and higher educational levels were more likely to own computers and have access to the Internet. Conversely, they found that Latino families were less likely to own a computer, and both Latino and African American families were less likely to have Internet access in the home. Using data from the 1997 Current Population Survey, Kreuger (2000) found that African American and Hispanic students were less likely to use the Internet in school than white students. Similarly, Kreuger found that teachers in schools that predominantly served minority students lagged other teachers in their degree of preparation and willingness to use technology.

In a study of Internet use in both metropolitan and non-metropolitan communities, Bradford and Whitacre (2003) found that blacks and Hispanics were less likely to be Internet users in both. Similarly, Fairlie (2004),using data from the 2000 Census, found that blacks and Hispanics were significantly less likely to own a home computer or use the Internet than whites. Differences in income and education explained some of the differences between the groups, but not all.

Differences in computer use by gender have also been noted. A considerable amount of prior research has found that women and girls are less comfortable using computers and use them less often (Chen, 1986; Comber et al., 1997; Miller et al., 2000; Mitra et al., 2000; Shashaani, 1994). Interestingly, however, the Calvert el al. (2005) study noted above, did not find gender differences in computer use for children between the ages of six months and six years. Similarly, in a study using data from the 2001 Current Population Survey, Bradford and Whitacre (2003) did not find evidence of a gender gap in computer access or use of the Internet. Nevertheless, prior research has revealed that women are less likely to be employed in the information technology sector and, if employed in that sector, tend to hold lower level types of positions (Lemons & Parzinger, 2001, Panteli et al., 2001). Finally, a study conducted by the U.S. Small Business Administration found that women small business owners were less likely to use computers in their businesses than men (E-commerce: Small Businesses Venture Online, 1999).

This study uses data from the 1998 Survey of Small Business Finances to explore computer use by minority and women-owned small businesses. It will compare use of computers by these firms to firms owned by white males and will also explore the ways in which small firms use computers. Finally, this research will attempt to identify those characteristics of small firms and their owners that predict the likelihood of using computers for the business.

## DESCRIPTION OF THE DATA

Data for this study were drawn from the 1998 Survey of Small Business Finances (SSBF). The SSBF is conducted every five years by the Federal Reserve Board and includes data on 3,561 small firms located in the United States. A small firm is defined as one having 500 or fewer employees. Survey firms represent a random sample stratified by size, geographic location, race, and gender. Sample weights are provided to allow for the creation of population estimates from the sample data. Those weights have been used for the analyses included in this article.

The 1998 SSBF includes balance sheet and income statement data on the included small firms, as well as information on each firm's use of financial products and financial service providers. It also includes questions on the firm's use of computers. The SSBF is the largest and most comprehensive dataset of its type. The 1998 survey is the most recent survey available to the public.

Tables 1 and 2 provide information on characteristics of the firms included in the 1998 SSBF by gender, race, and ethnicity. The SSBF includes 2,190 firms owned by white men, 605 firms owned by white women, 195 firms owned by black men, 209 firms owned by Hispanic men, and 153 firms owned by Asian men. The small number of remaining business owners were either minority women or firm owners who fell into other categories, i.e. American Indian, Pacific Islander, etc.

Table 1 reveals that, on average, firms owned by white men were significantly larger than women-owned and minority-owned firms in terms of total assets, total sales, and total number of employees. Firms owned by white men had average total assets of $519,018 compared to 241,811 for firms owned by white women, $142,229 for firms owned by black men, $147,748 for firms owned by Hispanic men, and $346,558 for firms owned by Asian men. Similarly, firms owned by white men had average total sales in 1998 of $1.22 million compared to $585,144 for firms owned by white women, $357,236 for firms owned by black men, $391,112 for firms owned by Hispanic men, and $818,775 for firms owned by Asian men. The spread of median values tended to be less extreme, but firms owned by white men were still larger than firms owned by white women and those owned by black and Hispanic men. All five groups of firms were relatively small in terms of number of employees ranging from a low of 5.57 employees for firms owned by black men to a high of 9.85 employees for firms owned by white men.

Although the firms owned by white men were significantly older than women-owned firms and firms owned by minority men, all of the firms in this sample were at least 10 years old on average, indicating that they were relatively established, mature firms. Similarly, all five groups of firms had relatively mature owners with average ages ranging from 46.84 years for Asian men to 50.93 years for white men. White male owners had significantly more years of experience than white women owners or minority male owners. Nevertheless, all five groups of firms included in the sample had an average of at least 14 years of experience.

Table 2 highlights some additional differences between firms owned by white men and those owned by white women and minority men. It indicates that firms owned by white men were significantly more likely to be organized as corporations or limited liability entities than those owned by white women or Hispanic men. Table 2 also reveals that the educational level of firm owners included in the sample was relatively high; over 50 percent of all five groups had attended college. Table 2 does reveal differences in industry concentration. Firms owned by white men were significantly less likely to be in service lines of business than firms owned by

white women (40.10% vs. 49.15%). Firms owned by white men were also significantly less likely to be in the field of retailing than Asian men (25.46% vs. 34.76%). Finally, firms owned by white men were significantly more likely to be in the field of construction than firms owned by white women, Hispanic men, or Asian men.

**Table 1 - Characteristics Firms included in 1998 SSBF: Mean Values**

| Variable[1] | | White Men | White Women | Black Men | Hispanic Men | Asian Men |
|---|---|---|---|---|---|---|
| N | | 2190 | 605 | 195 | 209 | 153 |
| Totassts | Mean | $519,018 | $241,811** | $142,229** | $147,748** | $346,558* |
| | Median | $67,877 | $39,919 | $38,456 | $34,700 | $65,000 |
| Totsales | Mean | $1,226,729 | $585,144** | $357,236** | $391,112** | $818,775 |
| | Median | $195,026 | $91,593 | $73,466 | $119,626 | $250,000 |
| Totemp | Mean | 9.85 | 6.26** | 5.57** | 6.02** | 7.28** |
| | Median | 4.0 | 3.0 | 3.0 | 3.0 | 4.0 |
| Firmage (yrs) | Mean | 14.55 | 11.44** | 12.01** | 11.34** | 10.01** |
| | Median | 12.0 | 9.0 | 9.0 | 9.0 | 9.0 |
| Ownage (yrs) | Mean | 50.93 | 49.27** | 49.52* | 47.85** | 46.84** |
| | Median | 50 | 49.0 | 50.0 | 48.0 | 46.0 |
| Exp | Mean | 19.91 | 15.03** | 15.88** | 16.26** | 14.47** |
| | Median | 20.0 | 13.0 | 14.0 | 15.0 | 14.0 |

[1]variables defined in Appendix A
*differences from white men significant at the .05 level
**differences from white men significant at the .01 level

**Table 2- Characteristics of Firms included in 1998 SSBF**

| Variable[1] | White Men | White Women | Black Men | Hispanic Men | Asian Men |
|---|---|---|---|---|---|
| N | 2190 | 605 | 195 | 209 | 153 |
| **Percentage of Total** | | | | | |
| Org | 48.68 | 37.91** | 43.67 | 36.06** | 45.85 |
| Ed | 53.66 | 55.78 | 51.98 | 53.75 | 55.87 |
| Serv | 40.10 | 49.15** | 46.54 | 46.17 | 48.35 |
| Manuf | 8.96 | 7.74 | 5.81 | 10.64 | 5.98 |
| Transp | 3.67 | 3.59 | 4.45 | 5.21 | 3.99 |
| InsRe | 6.94 | 5.97 | 6.96 | 4.61 | 2.21 |
| Retail | 25.46 | 26.98 | 23.77 | 25.54 | 34.76* |
| Contruc | 14.38 | 5.56** | 11.93 | 7.45* | 4.70** |
| Mining | 0.48 | 0.22 | 0.00 | 0.00 | 0.00 |

[1]variables defined in Appendix A
*differences from white men significant at the .05 level
**differences from white men significant at the .01 level

## COMPUTER USE BY SMALL FIRMS

As with larger firms, small firms can use computers and the Internet for a multitude of purposes. Small firms are embracing the use of technology with gusto. Use of computers allows many firms to automate functions previously performed by hand, thus lowering costs

while improving accuracy. Automation also allows for better documentation and record-keeping for ordering, payment, and tax purposes.

Most important, the use of computers, and more specifically the Internet, allows businesses to reach customers beyond the limits of their physical location. A report by the U.S. Small Business Administration noted that the percentage of small firms with access to the Internet doubled from 1996 to 1998 from 21.5 percent of firms to 41.2 percent of firms (E-commerce: Small Businesses Venture Online, 1999). The same report noted that small firms using the Internet generate higher revenues than those that do not. Typical uses include email, research, and Web sites to reach new and potential customers. Use of the Internet allows even very small firms to compete globally. In addition, a growing number of firms are posting customer service information on the Internet as a means of improving service delivery. A report by the U.S. Department of Commerce noted that businesses can use the Internet to cut the cost of purchasing, manage supplier relationships, streamline logistics and inventory management, and to plan production (The Emerging Digital Economy, 1998). Use of the Internet can open up new sales opportunities by offering customers convenience, choice, and often lower prices since "virtual" stores have lower fixed costs.

Starting in 1998, the SSBF included a set of questions specifically targeting computer use by small firms. These responses provide valuable insights into the extent to which small firms use computers and the purposes for which they use them. As Table 3 indicates, the data do reveal differences in computer use by gender, race, and ethnicity.

Table 3 reveals that firms owned by white men were significantly more likely to use computers for business purposes than firms owned by black men and firms owned by Asian men. For firms owned by white men, 78.69 percent used computers for business purposes compared to 75.38 percent of firms owned by white women, 61.61 percent of firms owned by black men, 73.50 percent of firms owned by Hispanic men, and 64.88 percent of firms owned by Asian men. For those firms that did use computers, the major uses were to manage accounting and bookkeeping, for administrative support, and for email. Over 60 percent of all five groups used computers for one of these three functions. Firms owned by Hispanic men were significantly less likely to use computers for administration than firms owned by white men (75.96% vs. 83.25%), while firms owned by black men were significantly less likely to use computers for accounting than firms owned by white men (72.13% vs. 83.80%). A relatively small percentage of firms used computers for banking or to apply for credit online. Firms owned by white women and those owned by black men were significantly less likely to use computers for banking than firms owned by white men. Approximately one-third used computers for Internet sales, a percentage that is likely to increase in future surveys. Finally, approximately 40 percent of those firms that used computers used them for inventory management.

These univariate results reveal differences in computer use by gender, race, and ethnicity. Nevertheless, a high percentage of all the small firms in the survey were using computers for some business purpose. Further, Table 3 suggests that small firms use computers for the same types of activities, regardless of gender, race, and ethnicity. It appears that the majority of small firms are using computers to automate functions previously performed by hand (accounting and administration) and to communicate both internally and externally (email). A considerably smaller number of firms are using computers for more "high touch" types of functions, i.e. selling goods to customers, providing customer service, banking, or applying for a loan. It may be that many small firms are not yet ready to trust technology with these more relationship-dependent types of activities.

**Table 3 - Computer Use by Firms included in 1998 SSBF**

| Variable[1] | White Men | White Women | Black Men | Hispanic Men | Asian Men |
|---|---|---|---|---|---|
| N | 2190 | 605 | 195 | 209 | 153 |
| **Percentage of Total** | | | | | |
| Usecomp | 78.69 | 75.38 | 61.61** | 73.50 | 64.88** |
| **Percentage of Those Who Indicated that They Were Computer Users** | | | | | |
| Compbank | 16.00 | 10.70** | 10.17** | 19.88 | 20.91 |
| Email | 75.71 | 76.44 | 74.93 | 70.60 | 66.59 |
| Intsales | 35.52 | 36.29 | 32.12 | 41.78 | 40.49 |
| Credapps | 5.34 | 4.90 | 7.78 | 5.88 | 5.95 |
| Invtmgt | 40.09 | 40.82 | 43.92 | 38.31 | 37.26 |
| Compadmn | 83.25 | 80.66 | 83.51 | 75.96 | 81.76 |
| Compacct | 83.80 | 82.64 | 72.13* | 81.52 | 84.72 |

[1]variables defined in Appendix A
*differences from white men significant at the .05 level
**differences from white men significant at the .01 level

## MULTIVARIATE ANALYSIS

As a second step in this analysis, a multivariate model was developed to explore the impact of various factors that might contribute to computer use by small firms. The weakness of univariate analysis is that it only examines the effect of one variable in isolation. Alternatively, multivariate analysis examines the effect of several variables acting in concert on a dependent variable, in this instance, computer use by small firms. A logistic regression model was developed having the following form:

Usecomp= a +b1Logsales + b2Totemp + b3Firmage + b4Serv + b5Transp + b6Retail +b7Insre + b8Construc + b9Mining + b10Org + b11Ownage + b12Ed + b13Whitewom + b14Blackmen + b15Hispmen+ b16Asianmen + e

Logistic regression was used to construct the model because the dependent variable is dichotomous rather than continuous (Aldrich & Nelson, 1984). The dependent variable, Usecomp, indicates whether or not the firm uses computers for business purposes. Independent variables are defined in Appendix A and reflect characteristics of the firm and its owner. A correlation analysis indicates that the independent variables are not highly correlated with each other or with the dependent variable.

Firm characteristics include measures of firm size, firm age, industry, and organizational status. One might anticipate that larger firms would have more complex types of requirements than very small firms (Julien & Raymond, 1994; Raymond, 1992). Thus, larger firms might be more likely to use computers for accounting, record-keeping, marketing, and the like. Firm size is measured by the variables Logsales and Totemp. The logged form of the sales variable was used since sales data are highly skewed. Totemp represents the total number of individuals employed by the firm.

Firmage is indicative of the age of the firm in number of years. It seems reasonable to expect that more mature and established firms would have developed the means to use computers and the Internet. Similarly, one might anticipate that older firms would be far enough along on the learning curve to recognize the value of computers in managing the firm and reaching out to customers.

Industry sector is reflected in the variables representing various major SIC categories. It may be that certain industries, such as retailing, lend themselves more to computer use for marketing and inventory management. Conversely, firms in the areas of insurance and real estate may be more likely to use computers for administrative and accounting purposes. A variable representing manufacturing firms (Manuf) was not included in the model to serve as a reference relative to the other SIC categories. Finally the variable Org is indicative of organizational status. Firms that have gone through the process of incorporating may be more sophisticated and may also be more willing to invest the time and effort required to computerize various business functions. Prior research suggests that firms with more complex organizational structures are more likely to use information technology (Julien & Raymond, 1994).

Characteristics of the firm owner are represented by variables reflecting gender, race, ethnicity, age, and educational level. Prior research has indicated that women are less likely to be computer users (E-commerce: Small Businesses Venture Online, 1999) leading to the inclusion of the variable Whitewom to reflect gender differences. Similarly, the variables Blackmen, Hispmen, and Asianmen are indicative of minority status. Prior research has suggested that minority individuals are less likely to use computers than whites (Fairlie, 2004). The variable representing white men (Whitemen) was omitted from the model to serve as a reference for the other gender, race, and ethnicity variables.

The variable Ownage represents the firm owner's age in number of years. Given the relative newness of the technology revolution, one might anticipate that older owners would be less comfortable using computers and less willing to trust them with key functions such as marketing, customer communications, and banking. Educational level has emerged as one of the major differentiating factors between those who use computers and those who do not (Falling Through the Net, 2000; A Nation Online, 2002). The variable Ed distinguishes between those small business owners who have attended college and those who have not.

## RESULTS

The results of the logistic regression analysis are provided in Table 4. These results indicate that larger firms and younger firms were more likely to use computers for business purposes. Larger firms are more likely to have complex types of requirements that could benefit from computerization, i.e. accounting, administrative functions, and marketing over the Internet. Younger firms may be less likely to have manual systems in place. Thus, they may be more open to computerizing functions from their point of inception. The results also indicate that firms organized as corporations or limited liability entities were more likely to use computers as anticipated. These firms are likely to be somewhat more sophisticated and may also have more complex requirements for record-keeping and reporting. Firms in the retail industry and the construction industry were less likely to use computers for business purposes than firms in the manufacturing industry. The finding regarding retailing is somewhat surprising since one might have expected that computers would provide a lot of benefit in the areas of inventory management, marketing, and communications with existing customers.

In terms of owner characteristics, the variable representing owner age was significant and negative while the variable representing educational level was significant and positive as hypothesized. As with firm age, younger owners may be better versed in the use of computers and aware of their potential benefits than more mature owners. Similarly, younger firm owners, due to their lifelong exposure to computers, may be more comfortable using them. Consistent with prior research, firm owners who had attended college were more likely to use computers for their businesses. More highly educated owners may be more aware of different

software packages and may also be more sensitive to the benefits that can be derived from using computers for various business functions.

**Table 4 - Results of Logistic Regression Analysis**
**Dependent Variable: Usecomp**

| Variable | Parameter Estimate | Wald Chi-Square | Pr>Chi-Square |
|---|---|---|---|
| Intercept** | -2.010 | 20.865 | 0.0001 |
| Logsales** | 0.302 | 159.299 | 0.0001 |
| Totemp | 0.007 | 1.873 | 0.1711 |
| Firmage** | -0.019 | 18.374 | 0.0001 |
| Serv | -0.288 | 1.935 | 0.1641 |
| Transp | -0.294 | 0.746 | 0.3877 |
| Retail** | -1.482 | 48.002 | 0.0001 |
| InsRe | 0.226 | 0.560 | 0.4541 |
| Contruc** | -1.281 | 30.733 | 0.0001 |
| Mining | -0.758 | 0.906 | 0.3411 |
| Org** | 0.799 | 54.367 | 0.0001 |
| Ownage** | -0.020 | 19.863 | 0.0001 |
| Ed** | 0.749 | 67.098 | 0.0001 |
| Whitewom | 0.089 | 0.605 | 0.4364 |
| Blackmen* | -0.557 | 5.019 | 0.0251 |
| Hispmen | -0.093 | 0.203 | 0.6517 |
| Asianmen** | -0.990 | 18.624 | 0.0001 |
| *differences from white men significant at the .05 level<br>**differences from white men significant at the .01 level | | | |

Finally, the variables representing Black men and Asian men were significant and negative indicating that black and Asian males were significantly less likely to use computers for their businesses than white males. This finding confirms the possibility of a "digital divide" for these two groups of minority firm owners. The results for Hispanic men, though negative, were not significant. Similarly, results for white women were positive but not significant indicating no difference between men and women in terms of their willingness to use computers for the business. This finding conflicts with prior research indicating that women business owners are significantly less likely to use computers than men (Ecommerce: Small Businesses Venture Online, 1999).

As a final step in the analysis, additional logistic regression models were constructed for each of the computer use functions for those firms that indicated that they did use computers for business purposes. In each model the dependent variable was a dichotomous variable indicating that the firm either did or did not use computers for that function. The models took the following form:

Compbank (or Email or Intsales or Credapps or Invtmgt or Compadmn or Compacct) = a +blLogsales + b2Totemp + b3Firmage + b4Serv + b5Transp + b6Retail +b7Insre + b8Construc + b9Mining + b10Org + b11Ownage + bl2Ed + b13Whitewom + b14Blackmen + bl5Hispmen+ bl6Asianmen + e.

The independent variables were the same variables used in the Usecomp model above. Results of these additional analyses are summarized in Table 5.

**Table 5 -Results of Logistic Regression Analysis**
**Computerized Functions in Small Firms**

Computer Function
(Parameter Estimates)

| Variable | Compbank | Email | Intsales | Credapps |
|---|---|---|---|---|
| Intercept | -2.479** | 0.501 | -0.393 | -2.79** |
| Logsales | 0.065 | 0.069* | 0.059* | 0.119 |
| Totemp | 0.006* | 0.008* | 0.001 | -0.004 |
| Firmage | -0.002 | -0.015** | -0.005 | -0.002 |
| Serv | 0.111 | 0.247 | 0.137 | 0.538 |
| Transp | 0.719** | -0.065 | -0.044 | 0.541 |
| Retail | -0.221 | -0.431* | 0.037 | 0.381 |
| InsRe | 0.301 | 0.554* | -0.155 | 0.424 |
| Contruc | -0.343 | -0.210 | -1.065** | -0.266 |
| Mining | -1.184 | 2.594 | -0.580 | 0.197 |
| Org | 0.085 | 0.267** | 0.203* | -0.283 |
| Ownage | -0.004 | -0.008 | 0.243** | -0.039** |
| Ed | 0.144 | 0.347** | 0.243** | 0.250 |
| Whitewom | -0.435** | 0.054 | -0.061 | -0.3369 |
| Blackmen | *0.537 | -0.092 | -0.220 | 0.453 |
| Hispmen | 0.325 | -0.206 | 0.220 | 0.006 |
| Asianmen | 0.308 | -0.529* | 0.043 | -0.060 |

| Variable | Invtmgt | Compadmn | Compacct |
|---|---|---|---|
| Intercept | 0.034 | -0.755 | 0.054 |
| Logsales | 0.061 | 0.140** | 0.153** |
| Totemp | 0.004* | 0.008 | 0.012* |
| Firmage | -0.001 | -0.007 | -0.002 |
| Serv | -1.047** | 0.496** | 0.056 |
| Transp | -0.904** | 0.454 | 0.240 |
| Retail | 0.329* | 0.003 | -0.191 |
| InsRe | -1.383** | 0.626* | 0.102 |
| Contruc | -0.992** | 0.077 | 0.488 |
| Mining | -0.082 | 12.490 | -1.241 |
| Org | 0.222* | 0.420** | 0.460** |
| Ownage | -0.015** | 0.001 | -0.103** |
| Ed | 0.130 | 0.260* | 0.110 |
| Whitewom | 0.024 | -0.009 | 0.168 |
| Blackmen | 0.197 | 0.092 | -0.456 |
| Hispmen | -0.092 | -0.314 | 0.027 |
| Asianmen | -0.226 | -0.142 | 0.034 |
| *differences from white men significant at the .05 level<br>**differences from white men significant at the .01level | | | |

Table 5 indicates that for those firms that actually did use computers, there were very few differences in types of use by either gender or minority status. White women were significantly less likely to use computers for banking than white men. Similarly, Asian males were significantly less likely to use email than white men, possibly because of language differences. Aside from that, firms owned by white women and firms owned by minority men used computers for the same type of functions as firms owned by white men.

Table 5 reveals that the major functional differences in computer use appear to be caused by differences in firm size, organizational status, owner age, and educational level. Larger firms and firms organized as corporations were more likely to use computers for various functions than smaller firms organized as partnerships or sole proprietorships. Larger, corporate entities undoubtedly have more complex types of needs and thus can benefit from the use of computers to manage different aspects of the business. In addition, younger owners and more highly educated owners were more likely to use computers for a greater number of business functions. As noted above, younger owners are more likely to be familiar and comfortable with computers and thus more willing to use them in their businesses. Similarly, more highly educated owners may have a greater appreciation for the benefits that can come from using technology.

Some differences in computer usage by function did emerge by industry sector or SIC code. Transportation firms were significantly more likely to use computers for banking than manufacturing firms. Retail firms were significantly less likely to use them for email than manufacturing firms, while insurance and real estate firms were significantly more likely to use computers for email. Not surprisingly, construction firms were significantly less likely to use computers for internet sales. Service, transportation, insurance/real estate, construction, and mining firms were all significantly less likely to use computers for inventory management than manufacturing firms, while retail firms were significantly more likely to use them for that purpose as one might anticipate. Finally, service firms and firms in the fields of insurance and real estate were significantly more likely to use computers for administrative purposes.

## SUMMARY AND CONCLUSIONS

Technology has had a dramatic impact on our lives in the last twenty years. More recently, the Internet has had an equally dramatic impact. On a personal level, many of us have used technology to communicate more effectively, keep records, prepare documents, search for information, and purchase goods and services. The same technological revolution has been underway for businesses. Increasingly, even small firms are using computers and the Internet to market their goods and services, to communicate and serve customers, to manage purchasing and inventory, and to automate accounting, administrative, and other functions. It stands to reason that over time, those firms that use computers would have a cost and marketing advantage over those that do not, thus creating two classes of firms, the technology haves and the have-nots. Prior research has suggested that women and minorities typically fall into the category of the have-nots, since they are less comfortable with computers and less likely to use them. Prior research has dubbed this gap as the "digital divide".

This research used data from the 1998 Survey of Small Business Finances to explore computer use by small firms, including firms owned by women and minorities to determine if differences in usage continue to persist. Results indicate that firms owned by black men and firms owned by Asian men were significantly less likely to use computers for business purposes than firms owned by white men. There were no significant differences for firms owned by white women or Hispanic men, however. These results also reveal that, in addition to differences by minority status, computer use appears to be determined by firm size, firm age, and organizational status. Age and educational level of the firm owner were also significant variables.

For those small firms that did use computers, they used them for essentially the same types of functions regardless of minority status or gender. It does appear, however, that larger firms and firms organized as corporations use computers for a greater number of business functions. The same holds true for firms owned by younger and more highly educated business owners. There were some differences in types of use by SIC code as one might anticipate. Firms in

certain industries may benefit by computerizing certain functions more than those in other sectors.

These results suggest that the digital divide still exists between various types of firm owners. Specifically, the owners of smaller firms, older firm owners, less educated firm owners, and members of some minority groups may still be at a relative disadvantage. These findings do suggest, however, that the digital divide between white men and white women has largely been eliminated, at least in the small business sector. This may be because computer use by small firms is still in its infancy; small firms are still primarily using computers for transactional types of functions such as email, administration, and accounting. More relationship-oriented computer functions such as banking, credit applications, and internet sales are still not widespread.

A shortcoming of this study is that it does not include firms owned by minority women since a relatively small number are included in the SSBF. Further research would be helpful in determining if a digital divide exists between small firms owned by minority men and those owned by minority women. Further research would also be helpful in determining the link between computer use and firm performance. The assumption implicit in this article is that computer use by small firms is a good thing, that it improves efficiency and quality, and that it enhances profitability. Further study is needed to determine if this is actually the case, or alternatively, if small firms are adding the costs associated with technology without reaping the benefits. Finally, further study is needed to determine if the differences in computer usage noted in this research disappear over time. This study was based on 1998 data collected by the Federal Reserve for the Survey of Small Business Finances. More recent data for the year 2003 will be released in 2006. One would hope that some of the differences noted between white-owned and minority-owned firms in this study would have been eliminated or at least lessened in that more recent data set.

Nevertheless, these results suggest that, although the digital divide between men and women small business owners has largely disappeared, there is still a divide between white and minority business owners. This finding has implications for small business development, training and education, and government policy. First, given the growing pervasiveness of computer use among suppliers, buyers, and competitors, minority-owned firms need to become comfortable with technology in order to compete effectively. Recent data reveal that online sales represent an increasing share of all retail sales. Thus, small business owners who are not computer literate run the risk of missing out on growth opportunities and losing market share.

Second, educational programs directed toward minority-owned small firms should include a training component that addresses computer use as a key element of small business management. Hands-on training will build not only skills but also confidence and a willingness to use computers for daily operations. Even prior to that stage, however, urban schools should ensure that computers are accessible to minority students who may not have them at home. Simultaneously, they should incorporate educational technology and computer use into their curricula in order to provide students with skills that will help them to advance in the labor market.

Finally, government policy should recognize the importance of technology use for small firms and should respond accordingly by incorporating funding and educational opportunities in grant or loan programs as well as in community development and training programs directed toward urban and/or minority entrepreneurs. By raising the technological competence and comfort level of minority small business owners, we can improve their chances for business survival, growth, and success.

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## Appendix 1 - Definition of Variables

Usecomp: Dichotomous variable; 1=firm uses computers for business purposes
Compbank: Dichotomous variable; 1=firm uses computers for PC banking
Email: Dichotomous variable; 1=firm uses computers for email
Intsales: Dichotomous variable; 1=firm uses computers for Internet sales
Credapps: Dichotomous variable; 1=firm uses computers to apply for credit online
Invtmgt: Dichotomous variable; 1=firm uses computers for inventory management
Compadmn: Dichotomous variable; 1=firm uses computers for administrative support functions
Compacct: Dichotomous variable; 1=firm uses computers to manage accounting and/or bookkeeping
Logsales: the log of 1998 sales
Totemp: total number of employees or FTEs
Firmage: age of the firm in years
Serv: Dichotomous variable; 1=the firm is in a service line of business
Transp: Dichotomous variable; 1=the firm is in the field of transportation
Retail: Dichotomous variable; 1=the firm is in a retail line of business
InsRe: Dichotomous variable; 1=the firm is in insurance or real estate
Construc: Dichotomous variable; 1=the firm is in the field of construction
Mining: Dichotomous variable; 1=the firm is in the field of mining
Org: Dichotomous variable; 1=the firm is organized as a limited liability corporation or partnership or as an S-corporation or a C-corporation
Ownage: age of the firm owner in years
Ed: Dichotomous variable; 1=the firm owner attended college
Whitewom: Dichotomous variable; 1=the firm is at least 50% owned by a white woman
Blackmen: Dichotomous variable; 1=the firm is at least 50% owned by a black male
Hispanmen: Dichotomous variable; 1=the firm is at least 50% owned by a Hispanic male
Asianmen: Dichotomous variable; 1=the firm is at least 50% owned by an Asian male

**Susan Coleman** is the Ansley Chair of Finance at the University of Hartford. She teaches courses in corporate and entrepreneurial finance at both the undergraduate and graduate levels. Her research interests include issues affecting women- and minority-owned small firms.