STEVEN BELLMAN, GERALD L. LOHSE,
AND ERIC J. JOHNSON

Predictors *of* Online Buying Behavior

What personal characteristics predict whether or not people buy on the Net? Look for a "wired" lifestyle and time starvation, not demographics.

CONSUMERS WORLDWIDE CAN SHOP ONLINE 24 HOURS A DAY, SEVEN DAYS A WEEK, 365 DAYS a year. Some market sectors, including insurance, financial services, computer hardware and software, travel, books, music, video, flowers, and automobiles, are experiencing rapid growth in online sales [7]. For example, in Jan. 1999, Dell Computer Corp. was selling an average of $14 million of equipment online per day [3], and Amazon.com has become the third largest bookseller in the U.S., despite being in business only since 1995 [6]. With projections that the Internet will generate consumer and business-to-business sales in excess of $294 billion by 2002 [2], online retailing raises many questions about how to market on the Net.

Shopping there is far from universal, even for those already online for other tasks. To help identify the factors influencing online shopping, the Wharton Forum on Electronic Commerce (ecom.wharton.upenn.edu) sponsors an ongoing research project begun in 1997 called the Wharton Virtual Test Market (WVTM). It seeks to understand Web consumer demographics, attitudes about online shopping, and predictors of online buying behavior. The major difference between the 1998 survey we conducted of WVTM members and other surveys is that its focus was on buying on the Net, trying not just to describe, but to model, the relationship between individual Net users' personal characteristics and their buying activity. The WVTM is a panel, most of whose members agreed to participate in further research. Although the 1998 survey established a baseline, we expect future research to examine differences in shopping behavior over time.

The Wharton Forum on Electronic Commerce began recruiting a panel of Web users from around the world in October 1997. As part of the participant registration process, 10,180 people completed a survey asking 62 questions about online behavior and attitudes about Internet communication and privacy

issues, as well as routine demographic questions. People were attracted to the survey site (wvtm.wharton.upenn.edu) through an online banner advertising campaign targeting specific segments of Web users worldwide, links provided by members' sites, and word of mouth. Survey respondents self-selected themselves as panel members, and their answers to survey questions were self-reported. Our analysis of the response data is a snapshot of the factors associated with buying online and the amounts of money online buyers are willing to spend there.

Self-selection and self-reporting also represent two limitations of the survey. We addressed self-selection by matching the survey sample demographics to known population data. While the panel is not a random sample, we targeted member recruitment to match the Media Metrix panel, which is a random sample of 10,000 PC-owning U.S. households used for projecting audience estimates of Web sites, and a U.S. Census sample (collected in 1990), according to such demographic information as gender, age, income, and education level. The size and demographics of the WVTM compare favorably with other samples of Web users recruited online, such as the regular Georgia Tech Graphics, Visualization & Usability (GVU) Center surveys of the Internet population (www.gvu.gatech.edu/ gvu/user_surveys/) [5, 9] and random sampling, such as the Media Metrix panel (www.media metrix.com/).

Self-reported data is subject to the fallibility of personal memories, idiosyncratic scale use, and even deliberate alteration by way of social desirability biases. We took steps to ensure that all respondents answered the WVTM questionnaire only once by, for example, using cookie technology to record whether or not they had already completed and submitted their responses, minimizing the possibility of collecting multiple entries from the same person. All respondents also had to provide email addresses that were valid at the time of completion. Still, additional research is needed to compare self-reported behavior against actual Web use.

WVTM Characteristics and the Online Population

Figure 1 compares the percentage of males and females from the U.S. participating in the WVTM with the percentages in other surveys and to the percentage in the overall U.S. population according to the most recent U.S. Census (1990). However, all these Internet surveys agree that the online population is relatively younger, more educated, wealthier, and has fewer African-Americans than the overall U.S. population, although the gaps are gradually closing. The median age of the WVTM's U.S. members is 29, or just younger than the overall population median (30 to 34 years). The median educational attainment of these U.S. members is "some college," compared to the population median level ("high-school graduate"). The median household income of the U.S. members and the ninth GVU survey (April–May 1998) is $35,000 to $49,999, a range that includes the U.S. population median ($35,225 in 1990), though lower than the median for the Media Metrix panel (July1997–June 1998) ($50,000 to $74,999). Among the WVTM's U.S. members, 85% are white, a percentage not much different from that in the overall U.S. population (82%) and less than the percentage of whites in the GVU sample (88%). However, African-Americans constitute only 3% of the WVTM population and only 2.3% of the GVU sample, compared to 12% in the overall U.S. population. These comparisons

Figure 1. Distribution of males and females from the U.S. in the WVTM survey (Nov. 1997-May 1998), the 1990 U.S. Census, the Media Metrix panel (July 1997-June 1998), and the ninth GVU survey (Apr. -May 1998).
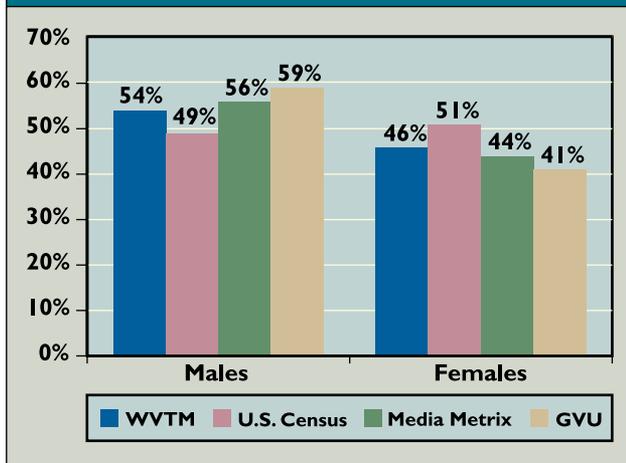
show that the opinions of WVTM members closely matched those of the overall U.S. online community, as shown through the comparison with the Media Metrix panel and with the overall U.S. population.

The WVTM panel includes participants from 82 countries; see Table 1 for a breakdown by continent. Having a worldwide panel allows us to compare the online behavior and attitudes of U.S. Web users with their counterparts in Europe, Asia, and elsewhere. In many countries, the Internet was introduced only recently, and the growth rate of Net use has been much slower, making it difficult to gauge the representativeness of a sample. But when grouped by region, the responses of WVTM members may indicate differences in Web use and attitudes shared by the Web users in similar commercial environments and cultures around the world.

Online Behavior
Although survey respondents report connecting to the Web more frequently at the office and at school, more of their Web-use hours are at home, with 21% reporting spending more than 20 hours per week on the Web browsing from home. Most of these people connect from home through 28.8 and 33.6 KB/sec modems, and from work or school via cable and direct connections (such as Ethernet). The most common regular use for the Internet (more than once per week) is for work—at home (52.3%) and at work (37.8%). The Internet is also used regularly at home to read news (19.1%) and for entertainment (10.8%). Less regularly (less than once a week), the Internet is put to more varied uses,

including looking for computer software and shareware (6.7%), banking (6.4%), and personal finance and investment information (3.8%). Only 2.9% of WVTM members say they look for product information, using the Internet less than once a week. Only 3.1% say they use the Internet for shopping.

Who Buys Online?
The survey asked members of the WVTM sample whether they had ever bought anything online. Roughly 4,368 (42.9%) said they have never bought anything online. We analyzed the factors that predicted actual purchases using logistic regression [8]. We took advantage of the large sample size by splitting the WVTM randomly into two separate halves to produce separate calibration and holdout samples. The calibration sample used a stepwise procedure to add candidate variables to the logistic regression equation. The final regression for the calibration sample was then used to predict whether members of the holdout sample would or would not buy anything online. This process was repeated, using the original holdout sample to calibrate the regression, then cross-validating this regression equation in the original calibration sample. For a highly significant 66% of members of the WVTM, the resulting equation correctly predicted whether or not they bought online. Figure 2 shows the variables that were significant in both runs of this dou-

Table 1. Continents represented in WVTM survey.		
Continent	**N**	**Percent**
Africa	28	0.3%
Asia	172	1.7%
Australasia	199	2.0%
Europe	415	4.1%
Rest of North America	562	5.5%
South Ameria	28	0.3%
U.S.	8,749	86.2%

ble cross-validation procedure, arranged in decreasing order of importance.

A Wired Lifestyle
Looking for product information on the Internet is the most important predictor of online buying behavior. More interesting, perhaps, are the results for the other predictors of online buying. They show that a typical online buyer has a "wired" lifestyle. Such people have been on the Internet for years, not

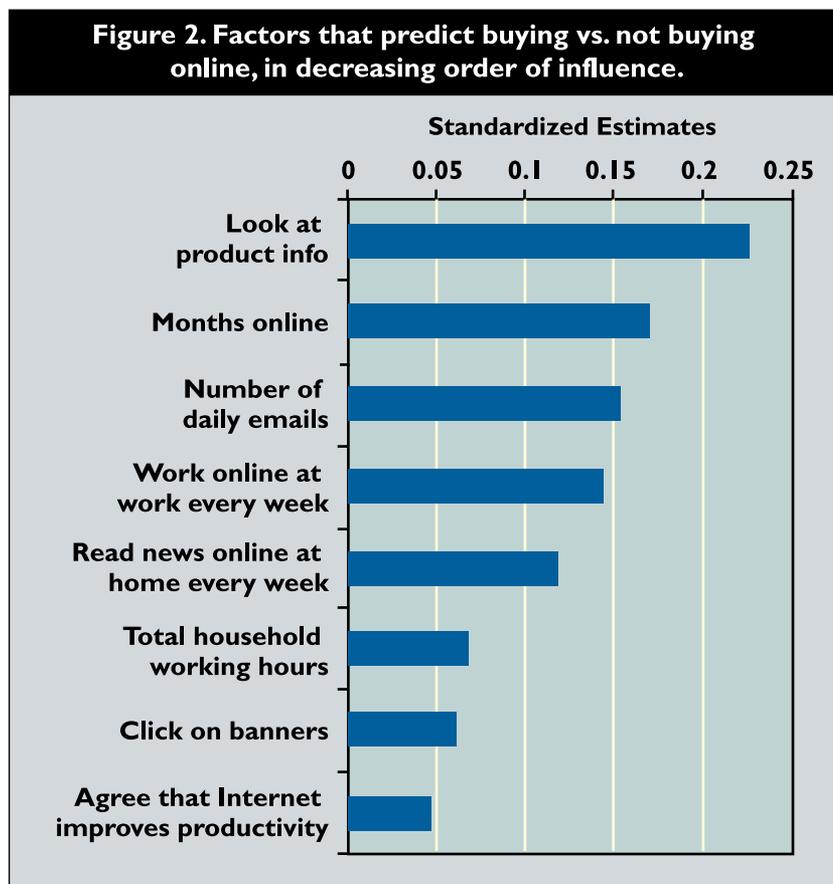Looking for product information on the Internet is the most important predictor of online buying behavior.

just a few months. They receive a large number of email messages every day, they work on the Internet in their offices every week, and they agree that the Internet and other developments in communication technology have improved their productivity at work. Just as they use the Internet for most of their other activities (such as reading the news at home), these people naturally turn to the Internet to search for product information and in many cases to buy products and services.

Another influence on a person's decision to shop online is the amount of discretionary time they have. As the total number of hours worked by members of a household increases, the less time there is to search for and buy products and services in the traditional way (by, say, visiting brick-and-mortar shops). More important, this effect is even stronger if one's spouse also works. Dual-income households seek new ways to find information and buy things that are faster and more convenient. In the past, they may have used catalogs; now they take advantage of e-commerce sites on the Web.

We asked members of the WVTM who bought things online how many online transactions they had made during the past six months and the value of their most recent online transactions. The median number of transactions completed during that time was two in the U.S. and Asia. But in Europe, the median was only one transaction during the preceding six months. The

median amount spent on the last transaction was $30 in the U.S., Asia, and Europe—or about the same as the average purchase from Amazon.com ($35) [4], but much less than other more conservative estimates of the average online transaction amount. For example, BizRate.com, which collects consumers' ratings of

Figure 2. Factors that predict buying vs. not buying online, in decreasing order of influence.

Standardized Estimates

| | 0 | 0.05 | 0.1 | 0.15 | 0.2 | 0.25 |

Look at product info
Months online
Number of daily emails
Work online at work every week
Read news online at home every week
Total household working hours
Click on banners
Agree that Internet improves productivity

online businesses (www.bizrate.com), estimated in late 1997 that the average online purchase for first-time shoppers was $109.

Figure 3 shows the distribution of the WVTM annual purchase value. The smaller the number of

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transactions, the more likely a smaller amount of money is involved as well. That is, the variance in annual value increases in proportion to an increase in annual value. The median amount spent online annually in 1997–1998 by the U.S. members of the sample was $200. European members spent $240, and Asian members spent $160. New users in the WVTM sample (those on the Internet two years or less) tend to spend less online per year compared with experienced users ($163 vs. $290).

These estimates are again conservative when compared to the $600 that members of the GVU sample claimed to have spent online in 1997 [5]. Assuming there are 79 million people online in the U.S. and Canada, of whom 20 million buy online [1], the total value of online buying annually in the U.S. and

Canada was approximately $4 billion. From this data, we can project that total online spending could increase to $23.7 billion in 2000, or about the same as Emarketer's $26 billion prediction for 2002 [2], but higher than the $7 billion projected for 2000 by Forrester Research, and much less than the $115 billion estimate by Morgan Stanley [11].

We also used another regression model to examine factors predicting annual spending online. First, we isolated the subsample of online buyers from the WVTM and again split this subsample in half randomly, using double cross-validation. The final regression equation could explain only 11% of the variance in annual value, but this percentage is significant given a sample of this size. The variables included in the final equation are listed in Figure 4, in decreasing order of importance; the length of each bar indicates the contribution one unit of each variable added to the annual value of a member of the WVTM.

Two influences again seem to be working in these variables— the wired lifestyle and time starvation. The wired lifestyle characterizes users who like to be the first to use the latest communication technologies, spend more hours online than most, and turn to the Internet to email their orders even when shopping from print catalogs. Time starvation is reflected in the negative coefficient for mailing in orders from print catalogs. For the people who spend more money annually online, regular physical mail is just too slow. Time-starved people, as well as those living a wired lifestyle, look for product information on the

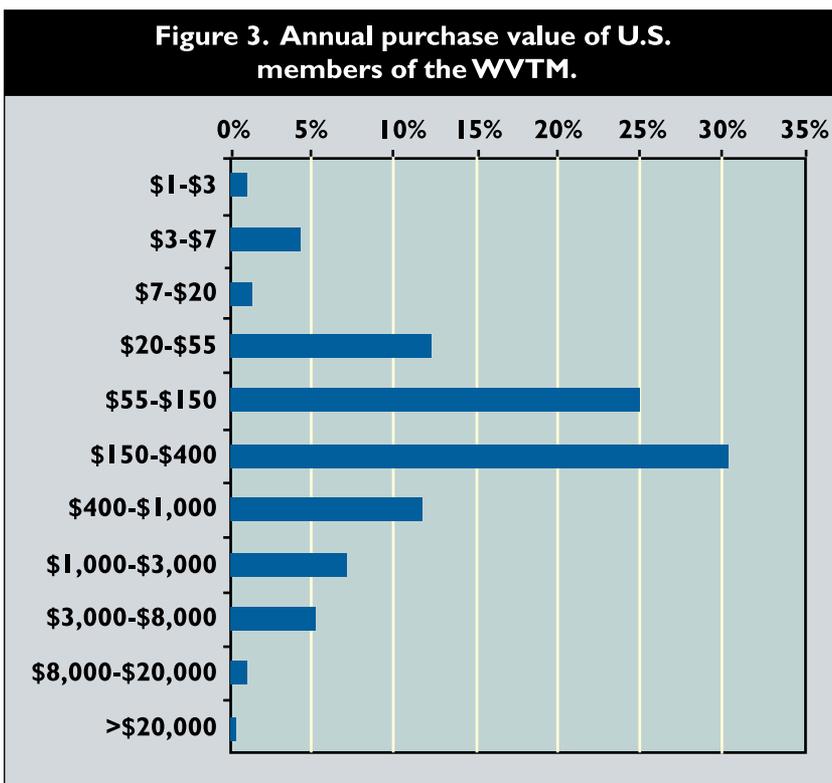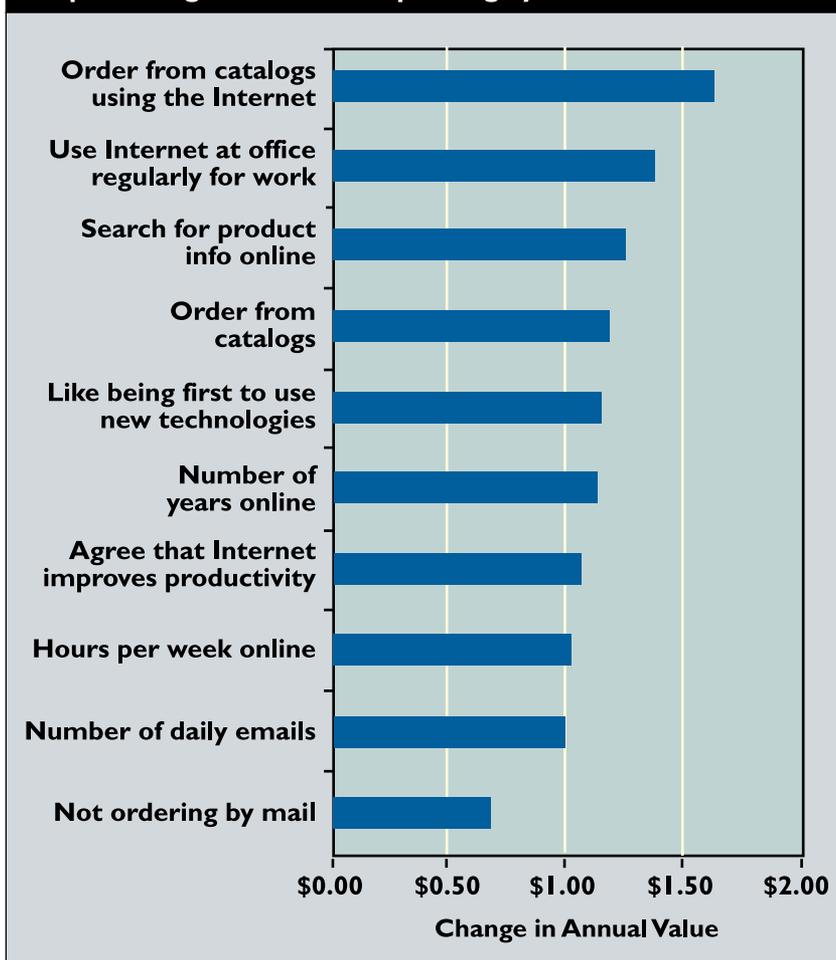## Figure 3. Annual purchase value of U.S. members of the WVTM.

Figure 4. Influence (in $U.S. of annual spending) for factors predicting annual online spending by WVTM members.

Order from catalogs using the Internet

Use Internet at office regularly for work

Search for product info online

Order from catalogs

Like being first to use new technologies

Number of years online

Agree that Internet improves productivity

Hours per week online

Number of daily emails

Not ordering by mail

$0.00 $0.50 $1.00 $1.50 $2.00

Change in Annual Value

ber of hours worked by the household), so we were unable to test the influence of such variables outside the WVTM. Their probable importance can be gauged by examining the proportion of variance they explain in the WVTM compared to the variables shared with the WVTM and the GVU. Indicators of time starvation (ordering from online catalogs and from print catalogs online) contribute a highly significant 8.5% of total explained variance in online transactions in the WVTM.

Predicting the Lack of Online Buying

The first of several surprises in these results is that demographics alone do not seem to influence whether or not people buy online, nor the amount of money they spend there. Demographics have some influence on whether or not a person is online in the first place compared with the rest of the overall national population; they are, for example, more likely to be white and more highly educated. However, once people are online, whether they buy there and how much they spend has more to do with whether they like being online and whether the time they have for buying things elsewhere is limited. However, even these general lifestyle characteristics explain only a small proportion of why people buy online and the amount of money they spend there.

In the GVU data, demographics do show a slight influence: The higher a person's income, education, and age, the more likely that person will buy online, and the higher a person's income, the more online transactions that person is likely to make. But this influence is barely significant; demographics alone predict 1.2% of decisions to buy or not buy and only 0.3% of the variance in the number of purchases made by online buyers. These results match findings from consumer behavior studies in other media in which demographics and lifestyle variables explain only a small percentage of people's choice behavior [10]. The most important information for predicting shopping habits—online and offline—are measures of past behavior, not demographics.

Internet, and a lot of what they see, they buy.

To show that these influences are also predictive of online buying behavior by people who are not members of the WVTM, we ran similar regressions using data from the ninth GVU survey (collected April–May 1998) [5]. Again, the wired lifestyle variables—number of months on the Internet, hours online per week, hours per week working online, searching for product information online, and the attitude that email is indispensable—predict buying and not buying for 77% of this sample. Because the entire GVU questionnaire was not compulsory, we maximized the available sample size by predicting the number of online transactions (N = 7,670), rather than the amount spent online (N = 1,141). (In the WVTM, number of transactions and amount spent were highly correlated, and the same variables predict both outcomes.) The same wired lifestyle variables explain 28% of annual online spending (note that "use of online news" replaces "agree that email is indispensable"). The GVU survey did not ask about time starvation (such as num-

Another surprise is the unimportance of privacy issues as predictors of buying vs. not buying online and the amount of money spent there. When the people who responded to the ninth GVU survey (April–May 1998) were asked why they bought things online, 39.1% said they were concerned about the security of credit card information [5]. However, in the same survey, only 1.9% of respondents reported having had a bad experience with buying online, and 76.2% had ordered something online, though ordering something online does not necessarily involve transmitting credit card information.

Security and privacy issues are important to all WVTM members. For example, they indicated their concern about the monitoring of online behavior and the exchange of information by third parties—concern shared equally in the U.S., Europe, and Asia. For example, when deciding to send personal information to a particular site, 49% of the U.S. WVTM members, 47% of the European members, and 46% of the Asian members said that whether or not a site uses encryption software was an important consideration. In any case, such concerns did not affect the decision to shop online and are not significant predictors of either the decision to shop online or the amount of money spent there. Thus, while they are concerned, WVTM members indicated that security and privacy concerns are increasingly less important predictors of shopping behavior.

Conclusion

The prototypical Web consumer leads a wired lifestyle and is time starved. So it seems that Web consumers shop online or use online services to save time. This result suggests several implications for the design of online shopping environments:

- Sites should make it more convenient to buy standard or repeat-purchase items (such as the one-click-to-purchase approach at Amazon.com and at 1-800-flowers, www.1800flowers.com);
- Customization should provide the information needed to make a purchase decision; and
- The checkout process should be easy for the consumer [6].

A more global conclusion might well be that these consumers are much more like catalog shoppers than Kmart shoppers, that is, they seem to value the Web's time savings over its cost savings. While this consumer attitude may change over time, convenience, rather than cost savings, may be a key benefit offered by successful online stores.

A final issue, which deserves to be examined in fur-

ther research, concerns the future of e-commerce in general. Our results show that people who spend more money online have a more wired lifestyle, are on the Net more, and receive more email compared to other Internet users. As Net use diffuses throughout the worldwide population, this profile is becoming increasingly common. But can we also expect a parallel increase in online shopping? The notion that online consumer commerce is a "following," rather than a "leading," use of home computers is best answered through "longitudinal" surveys of the members of the WVTM; we'll be doing just that in our future research. **C**

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STEVEN BELLMAN (stevenb@marketing.wharton.upenn.edu) is a research fellow in the Wharton Forum on Electronic Commerce at the University of Pennsylvania in Philadelphia.
GERALD L. LOHSE (lohse@wharton.upenn.edu) is the research director of the Wharton Forum on Electronic Commerce at the University of Pennsylvania in Philadelphia.
ERIC J. JOHNSON (ejj3@columbia.edu) is a professor of marketing in the Columbia School of Business at Columbia University in New York.