HOW INTERNET USERS DIFFER IN ON-LINE ACTIVITIES: THE INFLUENCE OF THEIR CHARACTERISTICS ON WHAT THEY DO ON-LINE

by

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(Under the direction of Brenda Cude)

ABSTRACT

This study investigated the influence of Internet users' demographic characteristics (age, income, education, gender, and race) and on-line characteristics (Internet experience, Internet connectedness, and access location) on their adoption of on-line transactions (on-line shopping, on-line financial services, and on-line auctions). A model based on the diffusion of innovations theory was proposed to explain such influence. Logistic regression was used to analyze the independent variables' effects on the dependent variables. Income, education, race, access location, on-line experience, and how connected the user felt to the Internet were significant in explaining Internet users' shopping on-line. Education, on-line experience, and how connected the user felt to the Internet were significant in explaining Internet users' adoption of on-line financial services. Gender, age, on-line experience, and how connected the user felt to the Internet were significant in explaining Internet users' adoption of on-line auctions.

INDEX WORDS: On-line shopping, adoption of on-line financial services, adoption of on-line auctions, diffusion of innovation.

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CHAPTER ONE

INTRODUCTION

When first developed in the late 1960s, the prototypes for what we know today as the Internet were largely designed to conduct academic and government research (U.S. General Accounting Office, 2000). However, with the rapid increase in ownership of personal computers and the advance of telecommunication technologies, the Internet has grown rapidly as an influence on Americans' everyday life. As of August 2000, more than one-half of American households had a computer, and more than 80% of these households had access to the Internet (U.S. Department of Commerce, 2000). Also in August 2000, 116.5 million Americans had access to the Internet, a 37.7% increase compared to 20 months earlier.

The adoption of the Internet has many implications for consumers, businesses, government agencies responsible for consumer issues, and consumer educators. Because of the Internet, today's consumers can access much more information about products before making a purchase decision. And by utilizing reliable on-line resources, they can optimize their purchases. Also, dissatisfied consumers can voice their complaints on the Internet by posting them on on-line discussion boards or on the websites of regulatory agencies.

This change in consumers' information acquisition and the ease of broadcasting complaints may cause a power shift between consumers and businesses (Pitt, Berthon, Watson, & Zinkhan, 2001). In comparison, consumers who cannot use the Internet

effectively for information search, or who do not have or choose not to have Internet access, will be disadvantaged. In a report released by the Federal Communications Commission (U.S. General Accounting Office, 2001), certain groups of Americans were identified as having difficulty accessing advanced telecommunication services. Such groups possess characteristics such as: having low incomes, having disabilities, being minority consumers, and being Native-Americans.

Several studies (Bhatnagar, Misra, & Rao, 2000; Boneva, Kraut, & Frohlich, 2001; Howard, Rainie, & Jones, 2001; Jackson, Ervin, Gardner, & Schmitt, 2001; Korgaonkar & Wolin, 1999; Sheehan, 1999; Trocchia & Janda, 2000) have demonstrated a relationship between differences in on-line behaviors and differences in demographic characteristics. However, the U.S. General Accounting Office (2001) concluded that since the Internet is still relatively new, demographic differences in Internet usage may disappear over time. In addition, at least one study (Howard et al., 2001) suggested that one's on-line experience was important in explaining differences in on-line behaviors. However, the relative influences of demographic characteristics versus on-line experience are still unclear.

A study by the U.S. Department of Commerce (1999) reported that Asian-American and Anglo-American households were more likely than African-American households to have Internet access at home. While Bhatnagar et al. (2000) found no effect of access location on likelihood of purchasing on-line, it is unknown whether access location will affect other on-line activities, such as financial transactions.

The purpose of this study is to further explain differences in on-line activities among people with different demographic characteristics and different amounts of

experience with the Internet. The study has two main objectives. The first one is to describe the characteristics of current Internet users. The second objective, which is the central one, is to determine whether there is a statistically significant relationship between different types of Internet users' on-line activities (shopping, financial transactions, and auctions) and the users' gender, race, age, income, and educational level, their experience with the Internet, where they access the Internet, and how connected the users feel to the Internet

In this study, on-line shopping will be defined as ever having bought a product on-line, such as books, music, toys, or clothing, or ever having bought or made a reservation for a travel service on-line, such as airline tickets, hotel rooms, or rental cars. On-line financial transactions will be defined as ever having done any banking on-line or ever having bought or sold stocks, mutual funds, or bonds on-line. On-line auctions will be defined as ever having participated in an on-line auction.

The hypotheses to be tested in this research will examine the effect of each of the independent variables on the dependent variables. There are hypotheses related to each of the three on-line activities that are the focus of this thesis.

Specifically, the literature suggests that income, education, gender, age, race, access location, on-line experience, and connectedness to the Internet are all related to on-line shopping. Previous studies suggest that education, access location, on-line experience, and connectedness to the Internet are important in explaining consumers' use of on-line financial services. While there is no academic literature on participation in on-line auctions, Boone (1970) suggests that gender, income, and education may be important variables in explaining use of on-line auctions.

Efforts were made in the design of this study to address the inadequacies in previous studies by including respondents' experience with the Internet as an independent variable and by using a nationally representative sample. However, the current research still has two major limitations. One is that no measure of respondents' Internet skills was included in the database and thus could not be included in the analysis. According to a study by the Graphics, Visualization & Usability (GVU) Center at the Georgia Institute of Technology (1998), Internet users with different Internet skill levels engaged in different on-line activities. Another limitation is that access location is measured by where the respondents went on-line the day before completing this survey. It is possible that the respondents did not report the access location they usually use simply because they did not use it the day before they completed the survey. For example, a respondent may have reported s/he did not go on-line from work yesterday because yesterday was a weekend. So the reported access location may or may not be the respondents' regular access location. However, the dataset does not provide a better measurement of the respondents' regular access location.

A strength of the current study is that it uses a sample that is representative of the general Internet population. The randomly selected sample used in the current study overcomes problems inherent in selecting respondents by random intercept as Miyazaki and Fernandez (2001) and Pan and Crask (2001) did.

The Internet population is becoming more and more like the general population, and the Internet is increasing in importance as a significant part of Americans' economic lives. This study contributes to the literature by including both demographic characteristics and characteristics related to Internet use to explain consumers' use of on-

line transactions. Considering the impact the Internet has on people's lives and inadequacies in existing studies, this study will be useful to policy makers, consumer educators, and businesses to understand and serve consumers better.

CHAPTER TWO

REVIEW OF LITERATURE

In this chapter, the literature on Internet users' demographic characteristics and on-line characteristics is reviewed. First, the background of this study is described. Then, the diffusion of innovations model is introduced as the theoretical framework. Literature on characteristics of adopters of on-line transactions is then discussed. Finally, based on the literature review, a model is developed which proposes that participation in on-line transaction activities is affected by both demographic characteristics and on-line characteristics.

Background

The Internet has experienced rapid growth in the United States in recent years. By August 2000, more than one-half of American households had a computer, and more than 80% of these households had access to the Internet (U.S. Department of Commerce, 2000).

In the earlier stages of the Internet, its user population was reported to be male, white, young, well-paid, and college-educated more often than the general population. A study by Schmidt (1997) indicated that Internet users were biased toward young men with middle and upper socio-economic and educational status. However, with the rapid penetration of the Internet, differences between the general population and Internet users have narrowed. According to the Graphics, Visualization & Usability (GVU) Center at the Georgia Institute of Technology (1998), the percentage of women among all Internet

users increased from 5% in 1994 to 34% in 1998. They also noted an increase in Internet access among older people, people with less-than-a-college education, middle-class or less income, and an African-American background. These changes make Internet users more representative of the general population.

With its rapid growth of coverage and increasing use by many segments of the general population, the commercial value of the Internet has become more obvious. Forrester Research, Inc. (2001) reported that Internet sales to consumers reached $48.3 billion in 2000, a 45.9% increase over one year earlier. Ernst & Young (2000) reported that the number of U.S. consumers who made at least one on-line purchase reached 39 million in 1999, a 30% increase over 1998. In another report from Forrester Research, Inc. (Punishill, 1999), it was projected that U.S. households would manage approximately $3 trillion on-line by 2003. The Wall Street Journal (2000) reported that the total amount spent on on-line travel reached $17 billion in 2000, and this accounted for 7% of the entire travel market, up from 5% in 1999. According to Bandyopadhyay, Lin, and Zhong (2001), one of the most visited on-line auction sites, eBay, had 850,000 registered users in 1998 and as many as 280,000 bids were made per day.

Diffusion of Innovations Model

Rogers' (1995) diffusion of innovations theory is useful in understanding consumers' adoption of on-line transactions. According to Rogers, adopters of innovations can be classified into five groups: Innovators, Early Adopters, Early Majority, Later Majority, and Laggards. Rogers identified the different characteristics of these five types of adopters as follows:

1. Innovators (INs): interest in new concepts leads them out of local networks; have control of substantial financial resources, career security, and the ability to understand and apply complex technical knowledge in their field.
2. Early Adopters (EAs): the greatest degree of opinion leadership, but a more integrated part of local networks than Innovators.
3. Early Majority (EM): interact frequently with peers and usually do not hold leadership opinions; a relatively longer innovation-decision period than Innovators and Early Adopters.
4. Later Majority (LM): relatively scarce resources and approach innovations cautiously.
5. Laggards (LGs): limited resources and confidence; must have certainty that innovation will not fail before adoption.

Thus, Rogers' theory suggests that consumers who adopt relatively new on-line transactions could be expected to have higher incomes, higher levels of education, and a greater degree of opinion leadership on new technologies.

Boone (1970) reviewed literature about Consumer Innovators and identified several characteristics of this group. According to Boone, relative to other consumers, Consumer Innovators were better educated, with higher incomes, high occupational mobility, higher leadership ability, and higher initiative.

The diffusion of innovations model has been used to guide studies of adoption of various innovations. In recent years, studies have focused on the application of Rogers' theory to computers and computer activities. Meeks and Sweaney (1992) studied a random sample of 148 consumers and reported that males were more likely to own a

computer than females. Dickerson and Gentry (1983) surveyed 639 respondents and found that Early Adopters of home computers were more likely to be middle-aged, with higher incomes, and more education. Early Adopters were also more likely to demonstrate opinion leadership, were information seekers, and were experienced with a variety of technical products and services.

Howard et al. (2001) used Rogers' (1995) model of diffusion of innovations to categorize Internet users based on their level of experience with the Internet. Depending on the length of their Internet experience and whether they logged onto the Internet the day before the survey, the researchers classified the Internet users in their study as Netizens, Utilitarians, Experimenters, or Newcomers. The results showed that differences in Internet experience did make a difference in the users' on-line activities. Netizens had the heaviest overall Internet use and used the Internet for a variety of purposes. Utilitarians were functional users of the Web while Experimenters valued the Internet mostly as an information resource. The Newcomers specialized in the entertainment aspects of Internet. What is interesting about this study is that Internet users' experience with the Internet was even more important than their demographic background in explaining their on-line behaviors.

Characteristics of Adopters of On-line Transactions

Three on-line transactions were the focus of this study:

1. Shopping on-line;
2. Adopting on-line financial services; and
3. Participating in on-line auctions.

The literature related to each of the three transactions is discussed below.

On-line shopping

Previous studies have shed some light on the characteristics of Internet users who shop on-line. Several studies have found income and/or education to be predictive of respondents' on-line shopping. Verhoef and Langerak (2001) reported that better-educated consumers with more time pressures were more likely to adopt on-line grocery shopping. Siu and Cheng (2001) studied characteristics of potential on-line shoppers in Hong Kong using a convenience sample of 200. They found potential early adopters of on-line shopping tended to have higher incomes. They were also more adventuresome, more willing to take risk, and more likely to be opinion leaders on technological products. Boone (1970) suggested that innovators must absorb the risks while followers need not; thus the wealth of individuals with higher incomes makes taking such risks relatively tolerable.

In a study of on-line food shopping, Morganosky and Cude (2000) surveyed 412 on-line grocery shoppers and found that they tended to have more education and higher incomes; they were also more likely to be younger and female. White (2000) reported positive relationships between respondents' education and years using the Internet and their purchase of food and drink on-line.

Several studies have demonstrated differences in on-line privacy concerns and computer anxiety by gender, and researchers inferred this could lead to gender differences in on-line transactions, including on-line shopping. Sheehan (1999) studied gender differences in on-line privacy concerns. Eight hundred and eighty nine respondents were randomly selected from an on-line directory for the study. The results

showed that female Internet users had more concerns about on-line privacy than male Internet users but were less likely to adopt protective measures than their male counterparts. The researcher inferred that female Internet users might refrain from conducting on-line transactions due to their high level of concern about Internet privacy.

One study on the general use of the Internet for transactional activities also reported on gender differences. Jackson et al. (2001) surveyed 630 Anglo-American college students about their e-mail and Web use. The female respondents in this study reported more computer anxiety, less self-efficacy about computer skills, and more unfavorable attitudes toward computer technology, compared with their male counterparts.

Researchers have found that the user's age influences his or her choice to shop on-line. Korgaonkar and Wolin (1999) conducted six focus group surveys with 401 Internet users. Their study reported that male users and older users were more likely than female users and younger users, respectively, to purchase on the Web. Bhatnagar et al. (2000) analyzed data collected by Georgia Institute of Technology's GVU Center (1997). They reported that older consumers were more likely to spend more time on-line and to purchase on-line.

Much of the research on the influence of race on on-line shopping has focused on access to the Internet. For example, in a study by the U.S. Department of Commerce (1999), a nationally representative sample of 48,000 households was surveyed. The study found that Asian-American and Anglo-American households were much more likely to have home Internet access than African-American and Hispanic households. Walsh

(2000) examined the influence of race on on-line buying and reported that Asian-Americans were 30% more likely than other ethnic groups to buy on-line.

Researchers have also reported that factors other than the users' demographic characteristics may have an important influence on adoption of on-line shopping. In a study by Miyazaki and Fernandez (2001), 160 respondents were selected via random interception for a survey about their attitudes toward privacy and security issues and on-line shopping. The researchers found that Internet users with more experience had less concern about on-line shopping risks, and therefore were more likely to purchase on-line. Phelps, D'Souze, and Nowak (2001) studied a random national sample of 556 and reported a negative relationship between consumers' privacy concerns and the possibility of them purchasing on-line. Shim, Eastlick, Lotz, and Warrington (2001) surveyed 2,000 households with home computers and found that intention to search for product information on-line was the most influential predictor of on-line purchasing. Pan and Crask (2001) sampled 184 respondents chosen by random intercept at stores. They reported that Internet shoppers were more likely to be confident, to have a better sense of time management, and to be attracted to Internet shopping by its convenience.

Bellman, Lohse, and Johnson (1999) concluded that a "wired" lifestyle was a strong predictor of whether one would buy on-line. According to them, people with a "wired" lifestyle were those who looked for product information on-line, had been on-line for years, received many e-mails everyday, considered e-mail indispensable, and were starved for time. A study by Vellido, Lisboa, and Meehan (2000) found no impact of age and income on on-line shopping. Instead, they reported lack of consumer trust as the main factor negatively related to on-line purchasing.

In addition to demographic characteristics, some research has examined the effect of access location on use of the Internet. Are Internet users more likely to conduct transaction-related on-line activities from home rather than from work, after controlling for all other variables? A study by Bhatnagar et al. (2000) reported that access location had no significant effect on Internet users' likelihood to purchase on-line.

On-line financial services

Other researchers have examined the characteristics of individuals who conduct financial services on-line, including banking as well as on-line trading. Lee and Lee (2000) reported direct relationships between education, income, and use of electronic banking in general; on-line banking is one component of electronic banking. Lockett and Lukas (1997) surveyed 1,000 bank customers and 500 consumers about the use of direct banking (banking through human telephone operators). They reported that adopters of direct banking had higher opinion leadership, a more favorable attitude toward change, and a higher involvement in related product categories such as using ATMs and purchasing over the telephone.

Barber and Odean (2000) reported that younger, well-educated people, and males were more likely to adopt on-line trading. According to Lach (1999), Asian-Americans were much more comfortable conducting financial transactions on-line and tended to have a higher trading balance. Li (2001) reported that adopters of on-line trading were more willing to accept risk and tended to be younger; other demographic characteristics, including income, education, and household status, were not related to adoption of on-line trading.

On-line auctions

Although participation in on-line auctions is a popular activity, there is no academic literature that addresses it. While the diffusion of innovations theory may be useful in describing participants in on-line auctions as Early Adopters, the research on this activity is exploratory.

Summary

Specifically, the literature suggests that income, education, gender, age, and race are all related to on-line shopping. Previous studies suggest that education, access location, on-line experience, and connectedness to the Internet are important in explaining consumers' use of on-line financial services. While there is no academic literature on participation in on-line auctions, the diffusion of innovations theory and literature based on that model (Boone, 1970; Howard et al., 2001; Meeks & Sweaney, 1992; Rogers, 1995) suggest that income, education, gender, age, access location, Internet experience, and connectedness to the Internet may be important variables in explaining use of on-line auctions. The literature indicates that males, older consumers, Internet users with higher incomes and higher levels of education, and those who access the Internet from home, have more Internet experience, and feel more connected to the Internet are more likely to use on-line auctions.

Model Development and Hypotheses

Based on the literature review, a model was developed that proposes that participation in on-line transaction activities is influenced by both demographic characteristics (income, education, gender, age, and race) and on-line characteristics (access location, experience on-line, and connectedness to the Internet). Specifically, the

model assumes that users of relatively newer and riskier on-line transactions such as on-line auctions are Early Adopters and thus are more likely to be younger, male, with higher incomes and education, and to have a wired lifestyle (longer experience with the Internet, with home access, and a stronger feeling of connectedness to the Internet). In contrast, since on-line shopping is a fairly typical on-line activity, one might expect on-line shoppers to look more like the general population of Internet users.

On-line shopping

Previous researchers (Verhoef & Langerak, 2001; White, 2000) reported that education was positively related with the respondent's decision to shop on-line; other studies (Morganosky & Cude, 2000; Siu & Cheng, 2001) reported that income had a positive relationship with shopping on-line. Therefore we hypothesize that:

H1a: Respondents with higher incomes are more likely to shop on-line than those with lower incomes.

H1b: Respondents with higher levels of education are more likely to shop on-line than those with lower levels of education.

Sheenan's (1999) study found more concerns about on-line privacy among female respondents and inferred this could prevent females from completing transactions on-line. Jackson et al. (2001) reported more computer anxiety among females. Thus it is posited that:

H1c: Female respondents are less likely to shop on-line than male respondents.

Several studies reported a positive relationship between age and shopping on-line (Bhatnagar et al., 2000; Korgaonkar & Wolin, 1999). Therefore it is posited that:

H1d: Older respondents are more likely to shop on-line than younger respondents.

Walsh (2000) found Asian-Americans were more likely to buy on-line. Thus it is posited:

H1e: Asian-American respondents are more likely to shop on-line than other ethnic groups.

Bhatnager et al. (2000) found no direct relationship between access location and the possibility of buying on-line. Thus it is posited that:

H2a: There is no relationship between the respondents' access location and shopping on-line.

Some studies (Bellman et al., 1999; Miyazaki & Fernandez, 2001; White, 2000) reported a positive relationship between Internet experience and shopping on-line. Thus it is posited:

H2b: Respondents with more experience with the Internet are more likely to shop on-line than those with less experience.

Bellman et al. (1999) reported a positive relationship between receiving many e-mails each day and buying on-line. Thus it is posited that:

H2c: Respondents who feel more connected to the Internet are more likely to shop on-line than those who feel less connected.

<u>On-line financial transactions</u>

Lee and Lee (2000) reported a direct relationship between education and income and the use of electronic banking. Barber and Odean (2000) reported adopters of on-line trading tended to be better educated, younger, and male. Lach (1999) reported that Asian-Americans were more likely to trade on-line. Thus, it is posited that:

H3a: Respondents with higher incomes are more likely to use on-line financial services than respondents with lower incomes.

H3b: Respondents with higher levels of education are more likely to conduct financial transactions on-line than those with less education.

H3c: Male respondents are more likely to use on-line financial services than female respondents.

H3d: Younger respondents are more likely to use on-line financial services than older respondents.

H3e: Asian-American respondents are more likely to use on-line financial services than other ethnic groups.

Since no previous studies investigated the relationship between a "wired" lifestyle and conducting financial transactions on-line, this study posits the relevant hypotheses in the null form:

H4a: There is no significant relationship between the respondents' Internet access location and their use of financial services on-line.

H4b: There is no significant relationship between the respondents' experience with the Internet and their use of financial services on-line.

H4c: There is no significant relationship between the respondents' connectedness to the Internet and their use of financial services on-line.

On-line auctions

There is no academic literature reporting research related to consumers' participation in on-line auctions. However, it seems reasonable to assume that participants in on-line auctions may be Early Adopters. Rogers' (1995) theory of

diffusion of innovations suggests that Early Adopters of innovations tend to have higher incomes and higher levels of education. Thus, it is posited that:

H5a: Respondents with higher incomes are more likely to participate in on-line auctions than respondents with lower incomes.

H5b: Respondents with higher levels of education are more likely to participate in on-line auctions than respondents with less education.

Participating in on-line auctions involves submission of financial information. Some studies (Jackson et al., 2001; Sheehan, 1999) reported more concerns about on-line privacy and more computer anxiety among females than among males. Thus it is posited:

H5c: Males are more likely to participate in on-line auctions than females.

The diffusion of innovations literature and research based on that model suggests that adopters of on-line transaction tend to be older (Boone 1970; Howard et al., 2001; Meeks & Sweaney, 1992; Rogers, 1995). Thus it is posited that:

H5d: Older respondents are more likely to participate in on-line auctions than younger respondents.

The literature does not suggest an expected relationship between race and adoption of on-line auctions. Thus,

H5e: There is no relationship between race and the adoption of on-line auctions.

Following the diffusion of innovations literature, the following hypotheses were written:

H6a: Respondents accessing the Internet from home are more likely to participate in on-line auctions than respondents accessing the Internet from other locations.

H6b: Respondents with more experience with the Internet are more likely to participate in on-line auctions than respondents with less experience with the Internet.

H6c: Respondents who feel more connected to the Internet are more likely to participate in on-line auctions than those who feel less connected.

CHAPTER THREE

METHODS

In this chapter, the research design, sample selection, data collection procedures, and survey instruments will be discussed.

A multivariate cross-sectional ex post facto design was used in this research. The dependent variables were the respondents' on-line transactional activities (on-line shopping, on-line financial transactions, and on-line auctions). The independent variables were the respondents' income, educational level, gender, race, age, Internet access location, experience with the Internet, and connectedness to the Internet. Due to the large sample required for this study, experimental and quasi-experimental designs were difficult to conduct. Also, since a control group was not available for an ex post facto design, selection threat in this study may be high.

Data

The data for this study were from a survey conducted by Princeton Survey Research Associates in March 2000. Simple random sampling was used as the sampling plan in this research. Three thousand five hundred and thirty three adult respondents (18 years old and above) were selected by random digit dialing. The last two digits of the telephone numbers were randomly selected to generate this sample based on area code, telephone exchange, and bank number (Princeton Survey Research Associates, 2001).

The sampling methods used offer both advantages and disadvantages. Simple random sampling gave each individual in the defined population an equal and

independent chance of being selected into the sample. This maximized the external validity of this study. Moreover, random digit dialing ensured that both unlisted and listed telephone numbers had an equal chance to be selected into the sample. However, random digit dialing also compromised the individual's equal and independent chance of being selected. For example, if a household had multiple telephone numbers, it would have a greater chance of being selected than those households with only one telephone number. Moreover, households with no telephone at all had no chance of being selected into the sample. Therefore, the final sample could not represent the general American population; instead, it was only representative of Americans who have at least one home telephone number.

Each selected number was called and the respondent was asked the survey questions by phone. Follow-up calls were made to contact households that were not available at the first calling. To enhance the chance of reaching the respondents, the surveyors staggered the follow-up calls across different time periods during one week and during one day. The survey used a daily rolling sample across the survey period that presents some concerns about responses to certain questions in the questionnaire. For example, the respondents were asked whether they went on-line the day before the survey. The responses could vary based on the day of the week the respondents were called for the survey.

Responses to questions related to the independent and dependent variables were used for this study. There were three dependent variables: on-line shopping, on-line financial transactions, and on-line auctions. On-line shopping was defined as ever having bought a product on-line, such as books, music, toys, and clothing or ever having bought

or made a reservation for a travel service on-line, such as an airline ticket, hotel room, or rental car. An on-line financial transaction was defined as ever having done any banking on-line or ever sold or bought stocks, mutual funds, or bonds on-line. The dependent variable on-line auction was defined as ever having participated in an on-line auction. Each of the three dependent variables had two levels: Yes (coded as 1) and No (coded as 2).

The independent variables were coded as follows:

Demographic characteristics:

Gender (nominal): male (coded as 1) versus female (coded as 2).

Age (ratio): continuous from 18 to 99.

Annual household income (interval with four categories): less than $20,000, $20,001-$40,000, $40,001-$75,000, and above $75,000.

Race (nominal with four categories): white, black, Asian, or other. Asian was treated as the omitted category for dummy variables and was coded as 0; white, black, and other were treated as dummy variables and coded as 1.

Educational level (ordinal with four categories): less than high school, high school graduate, some college education, or college and above.

On-line characteristics:

Internet access location (nominal in four groups): from home only, from work only, from both home and work, or from neither home nor work. From home only was treated as the omitted category for dummy variables and was coded as 0; each of the other three responses was treated as a dummy variable and coded as 1.

Experience on-line: (ordinal in four groups): respondents went on-line for the first time within the last six months, a year ago, two or three years ago, or more than three years ago.

Internet connectedness is a variable created by adding two variables -- how much one would miss going on-line if one could no longer do this and how much one would miss using email if one could no longer use email. Response choices for each of the two variables were: a lot, some, not much, or not at all. Values for the created variable could range from 2 (would not miss either going on-line or e-mail at all) to 8 (would miss both a lot).

Hypotheses

The hypotheses (see Table 1) in this study were related to the three types of on-line activities: on-line shopping, on-line financial transactions, and on-line auctions. Each of the hypotheses examined the effect of one of the independent variables on one of the respondents' on-line transaction activities.

On-line Shopping

H1a: Respondents with higher incomes are more likely to shop on-line than those with lower incomes.

H1b: Respondents with higher levels of education are more likely to shop on-line than those with lower levels of education.

H1c: Female respondents are less likely to shop on-line than male respondents.

H1d: Older respondents are more likely to shop on-line than younger respondents.

H1e: Asian-American respondents are more likely to shop on-line than other ethnic groups.

H2a: There is no significant relationship between the respondents' access location and shopping on-line.

H2b: Respondents with more experience with the Internet are more likely to shop on-line than those with less experience.

H2c: Respondents who feel more connected to the Internet are more likely to shop on-line than those who feel less connected.

On-line Financial Transactions

H3a: Respondents with higher incomes are more likely to use on-line financial services than respondents with lower incomes.

H3b: Respondents with higher levels of education are more likely to conduct financial transactions on-line than those with less education.

H3c: Male respondents are more likely to use on-line financial services than female respondents.

H3d: Younger respondents are more likely to use on-line financial services than older respondents.

H3e: Asian-American respondents are more likely to use on-line financial services than other ethnic groups.

H4a: There is no significant relationship between the respondents' Internet access location and their use of financial services on-line.

H4b: There is no significant relationship between the respondents' experience with the Internet and their use of financial services on-line.

H4c: There is no significant relationship between the respondents' connectedness to the Internet and their use of financial services on-line.

On-line Auctions

H5a: Respondents with higher incomes are more likely to participate in on-line auctions than respondents with lower incomes.

H5b: Respondents with higher levels of education are more likely to participate in on-line auctions than respondents with lower levels of education.

H5c: Males are more likely to participate in on-line auctions than females.

H5d: Older respondents are more likely to participate in on-line auctions than younger respondents.

H5e: There is no relationship between race and the adoption of on-line auctions.

H6a: Respondents accessing the Internet from home are more likely to participate in on-line auctions than those accessing the Internet from other locations.

H6b: Respondents with more experience with the Internet are more likely to participate in on-line auctions than those with less experience.

H6c: Respondents who feel more connected to the Internet are more likely to participate in on-line auctions than those who feel less connected.

Data Analysis

The data analysis strategy in this study consisted of two parts: descriptive data analysis and inferential data analysis. First, descriptive data analysis was conducted to provide the frequency distribution of respondents' on-line activities (shopping, financial transactions, and auctions), demographic characteristics (household income, educational level, gender, race, and age,), and on-line use characteristics (access location, connectedness to the Internet, and experience with the Internet). General tendencies were reported and compared to findings from other studies.

Second, inferential data analysis was performed to test the hypotheses in this study using a linear regression multivariate analysis model (Vogt, 1998). The proposed regression equation was:

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_{5w} x_{5w} + \beta_{5b} x_{5b} + \beta_{5o} x_{5o} + \beta_{6w} x_{6w} \quad (1)$$

$$+ \beta_{6hw} x_{6hw} + \beta_{6n} x_{6n} + \beta_7 x_7 + \beta_8 x_8 + \varepsilon$$

The demographic characteristics in the equation were: x_1 = income; x_2 = education; x_3 = gender (omitted = males); x_4 = age; x_5 = race (omitted = Asian, x_{5w} = white, x_{5b} = black; and x_{5o} = other)

The on-line characteristics in the equation were: x_6 = access location (omitted = access from home; x6w = access from work; x_{6hw} = access from both home and work, and x_{6n} = access from neither home or work); x_7 = experience with the Internet; x_8 = connectedness to the Internet. The error score was represented by ε in (1).

This model was run three times. The first time Y was the measure of on-line shopping and H1 and H2 were tested. In the second run, Y was on-line financial transactions and H3 and H4 were tested. The third time Y was on-line auctions and H5 and H6 were tested.

Prior to running the regression analysis, exploratory factor analysis was performed with varimax rotation to detect highly correlated independent variables. If detected, highly related independent variables could be grouped into sets of factors to explain the dependent variable in question. For example, if income and educational level were correlated, they could be combined to create a socioeconomic status variable.

Logistic regression was used to test the independent variables' effect on respondents' on-line transactional activities. Logistic regression was chosen because the

measure of each transactional activity was nominal, and the eight independent variables had different levels of measurement. The measures of gender, race, and access location were nominal; educational level, experience with the Internet, and connectedness to the Internet were ordinal; household income was interval; and age was ratio.

To analyze the effect of the independent variables on each of the on-line transactional activities, Wald χ^2 was used to test whether each independent variable had a statistically significant relationship with each transactional activity. An alpha level of .05 was adopted to judge whether the relationship was statistically significant. When a statistically significant relationship was found, a measure of association was computed to indicate the relative strength of the relationship. The measure of association was an unstandardized coefficient (b-value) and an odds ratio.

CHAPTER 4

RESULTS

Descriptive Statistics

Before weighting, the original unweighted dataset had a sample of 3,533 respondents, including 1,690 Internet users. Since non-response in telephone surveys tends to bias against certain subgroups in the population, the surveyor, the Princeton Survey Research Associates (2001), weighted the original sample based on the Census Bureau's Current Population Survey to represent all households in the United States. After the weighting, the sample of Internet users was 3,340. Table 2 and Table 3 present the demographic and on-line characteristics, respectively, of the Internet users in the sample.

The Internet users in the sample were relatively young; only 4.1% were 65 years and older. The average age of Internet users was 38.0 years. Their incomes were relatively high; 42.3% had an annual household income of $50,000 or more. People with at least some college education accounted for 68.3% of the study population. Internet users were equally distributed among males and females but predominantly white.

More than one-half (61.3%) of Internet users had been on-line for two years or more. (See Table 3). Most (46.3%) accessed the Internet from home but 34.5% accessed it from both home and work. Only 5.5% of Internet users accessed the Internet from neither place. These Internet users might have gone on-line from public places, such as libraries. More than one-half (52.8%) of Internet users in the sample said they would miss

going on-line and using e-mail some or a lot. Thus, their score was 7 or 8 on the Internet connectedness variable. The mean of 6.28 meant that, on average, Internet users would somewhat missing going on-line and using e-mail.

On-line shoppers vs. Internet users

As shown in Table 2, among the 3,430 Internet users, there were 1,969 Internet shoppers and 1371 non-shoppers. The next paragraphs compare on-line shoppers to all Internet users. Then, on-line shoppers and non-shoppers are compared.

Compared with all Internet users, on-line shoppers had higher incomes and education, and were more likely to be white (89.5% vs. 87.2%). Among all Internet users, only 42.3% had annual household incomes of over $50,000, while 48.5% of on-line shoppers had this much annual income. While nearly 15% (14.9%) of adopters of on-line shopping had an annual income of $100,000 and more; only 11.5% of Internet users had this much income. Only 68.3% of Internet users had at least some college education while 74.4% on-line shoppers had this much education. There was little difference between the average age of all Internet users (mean 38.0 years) and on-line shoppers (mean 37.8 years).

Compared with all Internet users, on-line shoppers were more experienced with and felt more connected to the Internet. Among all Internet users, 17.6% first went on-line within the last six months, while only 11.0% of on-line shoppers had less than six months of Internet experience. On-line shoppers were more experienced with the Internet than the full sample of Internet users; 70.6% of them went on-line at least two years ago, while only 61.3% of Internet users had that much experience. On-line shoppers felt more connected to the Internet; 61.8% reported they felt very connected compared to 52.8% of

all Internet users. A higher proportion of on-line shoppers (43.5%) accessed the Internet from both home and work than was true for the general population of Internet users (34.5%). A smaller proportion of on-line shoppers (9.6%) accessed the Internet from work compared to all Internet users (13.7%).

On-line shoppers vs. non-shoppers

Compared to Internet users who did not shop on-line, on-line shoppers were younger, had more income and higher levels of education, and were more likely to be male and white. (See Table 2.) The on-line shoppers' average age was 37.8 years old compared to 38.3 years old for non-shoppers. Close to one-half of on-line shoppers had an annual household income of $50,000 or more, while only 33.3% of the non-shoppers reported incomes of this amount. Nearly 14% of on-line shoppers had incomes between $75,000 and $100,000 compared to 7.6% of on-line non-shoppers. Nearly three-quarters (74.4%) of on-line shoppers had at least some college education, while only 59.6% of the non-shoppers had this much education. Both groups were predominantly white. In this study, among on-line shoppers, there were 5.9% black; however, among on-line non-shoppers, almost 12% were black. Asians comprised 1.8% of on-line shoppers, but only 0.9% of the on-line non-shoppers.

Compared with Internet users who do not shop on-line, on-line shoppers were more experienced with and felt more connected to the Internet. (See Table 3.) Nearly 71% (70.6%) of on-line shoppers went on-line at least two years ago while only 48.1% of on-line non-shoppers had that much Internet experience. Among all on-line non-shoppers, 27.3% first went on-line within the past six months while only 10.9% of on-line shoppers' Internet experience fell into this category. On-line shoppers were also

more connected to the Internet than non-shoppers. The average score of connectedness for Internet shoppers was 6.6 compared to 5.7 for non-shoppers. Nearly 62% of on-line shoppers had a connectedness score of 7 and higher, while only 38.4% of on-line shoppers had a score at this level. On-line shoppers (43.5%) were more likely to access the Internet from both home and work than non-shoppers (21.6%). However, on-line shoppers (9.6%) were less likely than non-shoppers (19.6%) to go on-line from work only.

Adopters of on-line financial services vs. Internet users.

There were 829 adopters and 2511 non-adopters of on-line financial services. Three Internet users either did not know if they had conducted financial transactions on-line or refused to respond. Their responses were treated as missing values.

Adopters of on-line financial services were younger, had higher incomes and a higher level of education than Internet users, and were more likely to be male and white. (See Table 2.) More than 57% of adopters of on-line financial services had an annual household income of more than $50,000, compared to 42.3% of Internet users. More than three-fourths (76.5%) of adopters of on-line financial services had at least some college; however, only 68.3% of all Internet users had this much education. Whites accounted for 85.5% of all adopters of on-line financial services. However, the percentage of Asians (2.6%) among adopters of on-line financial services was much higher than among all Internet users (1.5%).

Adopters of on-line financial services were more likely to be experienced with and feel connected to the Internet and more likely to access the Internet from both home and work. (See Table 3.) Over three-quarters (75.6%) of adopters of on-line financial

services first went on-line at least two years ago; only 61.3% of all Internet users had at least two years of Internet experience. Among adopters of on-line financial services, 67.8% were very connected to the Internet, compared to only 52.8% of the general Internet users. Adopters (54.8%) of financial services were also much more likely to access the Internet from both home and work than all Internet users (34.5%) and less likely to connect from home only (35.9% vs. 46.3%) and from neither home or work (1.6% vs. 5.5%).

Adopters of on-line financial services vs. non-adopters

The differences between the profiles of adopters and non-adopters of on-line financial services were similar to the differences between on-line shoppers and non-shoppers. Adopters of on-line financial services, with an average age of 37.3 years old, were slightly younger than the non-adopters. (See Table 2.) While 4.8% of non-adopters were 65 or older, only 2.2% of adopters of on-line financial services belonged to this age group. Adopters of on-line financial services had much higher incomes than non-adopters and more education. The gap in educational levels was most evident among those with at least a bachelor's degree; 32.1% of adopters had this much education compared to 32.8% of non-adopters. Adopters of on-line financial services were largely male (56.6%) and white (85.5%). While Asians accounted for 2.6% of adopters of on-line financial services, they comprised only 1.1 % of the non-adopters.

Adopters of on-line financial services were also more experienced with the Internet than non-adopters; 75.6% had at least two years of on-line experience, in contrast to only 56.5% of non-adopters. (See Table 3.) Among non-adopters of on-line financial services, 43.0% had Internet experience of no more than one year, while only 24.4% of

adopters had this little experience. Compared with non-adopters, adopters of on-line financial services were also more connected to the Internet, with an average score of 6.8 on the connectedness scale, 0.7 points higher than the mean for non-adopters. As in the case of on-line shopping, adopters of on-line financial services were more likely to access the Internet from both home and work; 54.8% of them accessed the Internet from both locations compared to only 27.8% of the non-adopters. However, adopters of on-line financial services were less likely than non-adopters to access the Internet from work only (7.7% versus 15.7%).

Participants in on-line auctions vs. Internet users

There were 281 adopters and 1,608 non-adopters of on-line auctions in this study. Among all of the Internet users, there were 1,453 Internet users who either did not know if they had ever participated in an on-line auction or refused to respond. Their responses were treated as missing values.

Comparison between the adopters and non-adopters of on-line auctions revealed some similar patterns to those found in the comparison of adopters and non-adopters of on-line shopping and financial services. However, participants in on-line auctions also were unique in certain ways.

Adopters of on-line auctions were younger than the general population of Internet users, 35.5 versus 38.0 years old. (See Table 2.) They also had higher incomes; nearly one-half (49.3%) of adopters of on-line auctions had an annual household income of $50,000 compared to only 42.3% of all Internet users. In contrast, adopters of on-line auctions had *less* education than the full group of Internet users; 65.3% had at least some college, compared to 68.3% of all Internet users. There was a big gender gap among

participants in on-line auctions. Males accounted for 64.0% for adopters of on-line auctions compared to only 50.4% of all Internet users. Whites were 87.2% of all Internet users, but 91.4% of adopters of on-line auctions. While blacks accounted for 8.4% of all Internet users, they represented only composed 4.1% of adopters of on-line auctions.

Adopters of on-line auctions were predominantly people experienced with the Internet, those who felt very connected to the Internet, and those who connected to the Internet from both home and work. (See Table 3.) Over three-quarters (78.3%) of participants in on-line auctions had been on-line two or more years, compared with 61.3% of all Internet users. Among adopters of on-line auctions, people who were very connected to the Internet accounted for 68.8% of the total, while they comprised only 52.8% of all Internet users. Over one-half (50.5%) of participants in on-line auctions accessed the Internet from both home and work, compared to only 34.5% of all Internet users.

Participants in on-line auctions vs. nonparticipants

Adopters of on-line auctions were younger than non-adopters and more likely to be male, white, and to have higher incomes but less education. (See Table 2.) Their average age was 35.5 as compared to 38.0 for non-adopters; only 2.9% of adopters were 65 years old or older. Nearly one-half (49.3%) of adopters of on-line auctions had an annual income of $50,000 compared to 41.0% of non-adopters. Unlike on-line shoppers and users of on-line financial services, adopters of on-line auctions had less education than non-adopters. Among adopters, only 65.3% had at least some college education, while over 72% of non-adopters had education at this level. Males far outnumbered females among adopters of on-line auctions (64.0% versus 36.1%).

Compared to non-adopters, adopters of on-line auctions had more Internet experience, were more connected to the Internet, and were more likely to access the Internet from both home and work. (See Table 3.) Among adopters of on-line auctions, 78.3% had at least two years of Internet experience, while only 61.2% of non-adopters had that much Internet experience. Nearly 69% of adopters of on-line auctions felt very connected to the Internet, while only 49.3% of non-adopters felt highly connected to the Internet. Adopters of on-line auctions were more likely than non-adopters to access the Internet from both home and work (50.5% versus 33.2%) and a higher percentage of non-adopters (15.3%) than adopters (5.1%) accessed the Internet from work only.

Logistic Regression Analysis

Before testing the hypotheses in this study, a test of multicollinearity was run. High correlation was not found among the independent variables (see Table 4).

To test the hypotheses in this study, logistic regression was conducted. The dependent variable, respondents' adoption of each of the three on-line transactional activities (shopping, financial transactions, and auctions), was calculated as the log odds of adopting one of the on-line transactions. Both a chi-square of likelihood and a model chi-square were computed to determine the statistical significance of the model as a whole. Wald chi-squares were also calculated to detect the statistical significance of each independent variable. To indicate the direction and size of the relationship between the dependent variable and each independent variable, unstandardized coefficients (b-values) were also computed.

Adoption of on-line shopping

As shown in Table 5, the model was statistically significant in predicting the log odds of adoption of on-line shopping. The model produced a chi-square likelihood ratio of 371.9981 ($p < 0.0001$) and a model chi-square of 306.4071 ($p< 0.0001$). The pseudo R square of 0.1124 indicates that the whole set of independent variables improved the predictive efficacy of respondents' adopting on-line shopping by 11.24% as compared to the null model.

Analysis of the Wald chi-square for each independent variable indicated that eight independent variables were significantly related to respondents' adopting on-line shopping. The variables were: household annual income (Wald $\chi^2 = 17.3243$, $p < 0.0001$), education (Wald $\chi^2 = 24.5681$, $p < 0.0001$), age (Wald $\chi^2 = 13.3703$, $p = 0.0003$), being black as compared to being Asian (Wald $\chi^2 = 8.1316$, $p = 0.0044$), work as the only access location (Wald $\chi^2 = 26.5809$, $p < 0.0001$) and both home and work as the access locations as compared to home as the only access location (Wald $\chi^2 = 7.3060$, $p = 0.0069$), experience on-line (Wald $\chi^2 = 37.1363$, $p < 0.0001$), and Internet connectedness (Wald $\chi^2 = 58.2334$, $p < 0.0001$).

A further investigation of the coefficients revealed the direction and size of the relationship between each of these significant independent variables and respondents' use of on-line shopping.

The coefficient of household annual income was positive. The odds ratio of 1.110 indicated that with a one-unit increase in income, the odds of Internet users' adopting on-line shopping increased by 11%.

The coefficient of education was also positive, indicating a positive relationship between educational level and odds of adopting on-line shopping. The odds ratio of 1.184 indicated that Internet users with one more level of education (as measured on the education scale) were 1.184 times as likely to adopt on-line shopping as those who were one level lower on the education scale.

Age had a negative coefficient, which meant that as age increased Internet users were less likely to adopt on-line shopping. The odds ratio of 0.965 meant a one year increase in an Internet user's age reduced the odds of adopting on-line shopping by about 3.4%.

Being black compared to being Asian had a negative coefficient. Coupled with the odds ratio of 0.371, being black rather than Asian reduced the odds of shopping on-line by 62.9%.

Going on-line from work only compared to from home only also had a negative coefficient. The odds ratio of 0.489 indicated that compared with accessing the Internet from home only, accessing the Internet from work only reduced the odds of shopping on-line by 51.1%.

In contrast, going on-line from both home and work as compared to from home only had a positive coefficient. The odds ratio of 1.334 meant that people going on-line from both places were 1.334 times as likely as those going on-line from home only to shop on-line.

Both experience on-line and Internet connectedness had positive coefficients. The coefficients suggest that as one's Internet experience and connectedness increased, one's odds of shopping on-line also increased. The odds ratio of 1.323 for on-line experience

indicated that as one's Internet experience increased one level on the scale, his/her odds of shopping on-line also rose by 32.3%. The odds ratio of 1.219 for Internet connectedness meant that one more degree on this scale increased the odds of shopping on-line by 21.9%.

Adoption of on-line financial services

As shown in Table 6, the model for on-line financial services was also statistically significant in predicting the log odds of adoption of on-line financial services. The model produced a chi-square likelihood ratio of 336.4400 ($p < 0.0001$) and a model chi-square of 278.6882 ($p< 0.0001$). The pseudo R square of 0.1128 indicated that the whole set of independent variables improved the predictive efficacy of respondents' adopting on-line financial services by 11.28% as compared to the null model.

The analysis of Wald chi-square for each independent variable found that seven independent variables were significantly related to respondents' adopting on-line financial services. The variables were: household annual income (Wald $\chi^2 = 46.4087$, $p < 0.0001$), education (Wald $\chi^2 = 5.4628$, $p =0.0194$), age (Wald $\chi^2 = 13.3767$, $p = 0.0003$), being white as compared to being Asian (Wald $\chi^2 = 7.5010$, $p = 0.0062$), accessing the Internet from both home and work as compared to home as the only access location (Wald $\chi^2 = 29.7395$, $p < 0.0001$), experience on-line (Wald $\chi^2 = 34.1645$, $p < 0.0001$), and Internet connectedness (Wald $\chi^2 = 27.3472$, $p < 0.0001$).

A further investigation of the coefficients revealed the direction and size of the relationship between each of these significant independent variables and respondents' adoption of on-line financial services.

The coefficient of household annual income was positive. The odds ratio of 1.206 indicated that Internet users who were one level higher on the income scale were 1.206 times as likely to adopt on-line financial services as those who were one level lower on the income scale.

The coefficient of education was also positive, indicating a positive relationship between educational level and likelihood of adopting on-line financial services. The odds ratio of 1.092 indicated that Internet users with one more level of education (as measured on the education level) were 1.092 times as likely to adopt on-line financial services as those who were one level lower on the education scale.

Age had a negative coefficient, which meant that as age increased, Internet users were less likely to adopt on-line financial services. The odds ratio of 0.985 meant that a one year increase in an Internet user's age reduced the odds of adopting on-line financial services by about 1.5%.

Being white as compared to being Asian also had a negative coefficient. Coupled with the odds ratio of 0.470, being white reduced the odds of adopting on-line financial services by 53% as compared to being Asian.

Going on-line from both home and work as compared to from home only had a positive coefficient. The odds ratio of 1.799 meant that people going on-line from both places were 1.799 times as likely as those going on-line from home only to adopt financial services on-line.

Both on-line experience and Internet connectedness had positive coefficients. This indicated that as one's Internet experience and connectedness increased, one's odds of adopting on-line financial services also increased. The odds ratio of 1.365 for on-line

experience indicated that as one's Internet experience moved up one level on the scale, his/her odds of adopting on-line financial services increased by 36.5%. The odds ratio of 1.177 for Internet connectedness meant that a one unit increase on this scale increased the odds of adopting on-line financial services by 17.7%.

Adoption of on-line auctions.

As shown in Table 7, the model for on-line auctions was also found to be statistically significant in predicting the log odds of adoption of on-line auctions. The model produced a chi-square likelihood ratio of 135.5222 ($p < 0.0001$) and a model chi-square of 109.6383 ($p < 0.0001$). The pseudo R square of 0.1037 indicated that the whole set of independent variables improved the predictive efficacy of respondents' adopting on-line auctions by 10.37% as compared to the null model.

The analysis of Wald chi-square for each independent variable found that seven independent variables were significantly related to respondents' adopting on-line auctions. They were: education (Wald $\chi^2 = 7.6899$, $p = 0.0056$), gender (Wald $\chi^2 = 26.0133$, $p < 0.0001$), age (Wald $\chi^2 = 9.0224$, $p = 0.0027$), work as the only access location as compared to home as the only access location (Wald $\chi^2 = 5.1025$, $p = 0.0239$), neither work or home as the access location as compared to home as the only access location (Wald $\chi^2 = 4.7125$, $p = 0.0299$), experience on-line (Wald $\chi^2 = 10.2004$, $p = 0.0014$), and Internet connectedness (Wald $\chi^2 = 24.7322$, $p < 0.0001$).

A further investigation of the coefficients revealed the direction and size of the relationship between each of these significant independent variables and respondents' adopting on-line auctions.

Unlike on-line shopping and financial services, the coefficient of education in the on-line auctions model was negative, indicating an inverse relationship between educational level and the likelihood of adopting on-line auctions. The odds ratio of 0.856 indicated that an increase of one level of education (as measured on the education scale) reduced the odds of adopting on-line auctions by 14.4%.

Gender also had a negative coefficient, indicating males had higher odds of participating in on-line auctions. The odds ratio of 0.460 meant that being female reduced the odds of participating in auctions on-line by 54%.

Age had a negative coefficient, which indicated that as age increased, Internet users were less likely to adopt on-line auctions. The odds ratio of 0.981 meant that a one-year increase in an Internet user's age reduced the odds of adopting on-line auctions by about 1.9%.

Going on-line from work only compared to from home only also had a negative coefficient. The odds ratio of 0.501 meant that people going on-line from work only had around 50% lower odds of participating in on-line auctions than those going on-line from home only.

Going on-line from neither work nor home as compared to from home only also had a negative coefficient. The odds ratio of 0.160 meant that people going on-line from neither work or home had around 16% lower odds of participating in on-line auctions than those going on-line from home only.

As in the other two analyses, both experience on-line and Internet connectedness had positive coefficients. The positive coefficients indicated that as one's Internet experience and attachment increased, one's odds of participating in auctions on-line also

increased. The odds ratio of 1.307 for experience on-line indicated that as one's Internet experience moved up one level on the scale, his/her odds of adopting on-line auctions increased by 30.7%. The odds ratio of 1.283 for Internet connectedness meant that one additional unit on this scale increased the odds of adopting on-line auctions by 28.3%.

CHAPTER 5

DISCUSSION AND SUMMARY

This study researched the relationship between participation in three on-line transaction activities and the respondents' demographic and on-line characteristics. Because the dependent variables (on-line shopping, on-line financial transaction, and on-line auctions) were dichotomous variables, logistic regression was used in this study to test the proposed hypotheses. A summary of the results of testing the hypotheses is in Table 1.

Four demographic characteristics, income, education, age, and race, were significantly related to the respondents' likelihood of shopping on-line. As posited in H1a, there was a positive relationship between respondents' likelihood of adopting on-line shopping and household income. This was consistent with the findings from Siu and Cheng (2001). Also as expected in H1b and found by White (2000), respondents with higher education were more likely to shop on-line. There was not a significant relationship between gender and shopping on-line; thus, H1c was not supported. Contrary to H1d and findings by Korgaonkar and Wolin (1999) and Bhatnagar et al. (2000), age was negatively, rather than positively related to shopping on-line; older respondents were less likely to shop on-line. This could be because older respondents were relatively less familiar with computers and Internet technology. H1e was partially confirmed; consistent with Walsh's (2000) findings, being black reduced the odds of shopping on-line as compared with being Asian.

Access location, Internet experience, and Internet connectedness were all significantly related to shopping on-line. H2a was partially confirmed; accessing the Internet from work only reduced the odds of shopping on-line as compared with accessing the Internet from home only. However, people who accessed the Internet from both home and work had higher odds of shopping on-line than those accessed the Internet from home only. Both hypotheses H2b and H2c were confirmed; both Internet experience and connectedness were positively related with the likelihood of shopping on-line.

Four demographic variables, income, education, gender, and age, had a significant relationship with adopting financial services on-line. Consistent with Lee and Lee's (2000) research, income was positively related to respondents' adoption of on-line financial services; thus, H3a was supported. The relationship between education and respondents' adoption of on-line financial services was also positive, therefore confirming H3b and agreeing with previous research (Barber & Odean, 2000; Lee & Lee, 2000). On-line financial services make banking and trading on-line less time intensive, which might attract Internet users with higher socio-economic status who have higher opportunity costs and more accounts to manage. The convenience of conducting financial transactions on-line provides adopters who have more financial assets to manage with greater gains from efficiency**.** Males were more likely than females to adopt on-line financial services; thus, H3c was supported. This might be related to more concerns about on-line privacy and higher computer anxiety among female respondents reported by Sheenan (1999) and Jackson et al (2001). Younger respondents were more likely to adopt on-line financial transactions, thus confirming H3d and agreeing with research by Barber and Odean (2000). Asian-Americans were less likely than whites to adopt on-line

financial transaction and not significantly different from blacks and other races in adoption of on-line financial services. Thus, H3e was not supported. This was contrary to findings by Lach (1999) who found Asian-Americans were more likely than other races to trade on-line.

Access location, Internet experiences, and Internet connectedness were all significantly related to adopting on-line financial services. Accessing the Internet from both home and work (compared to from home only) increased the respondents' likelihood of adopting of on-line financial services. Therefore, H4a was not supported. Both experience with the Internet and Internet connectedness were positively related with respondents' adoption of on-line financial services. Both H4b and H4c were written as null hypotheses and thus were not supported.

Three demographic characteristics, education, gender, and age, were significantly related to respondents' participation in on-line auctions though the directions of the relationships were not all as hypothesized. Income was not significantly related to respondents' participation in on-line auctions; thus, H5a was not supported. There was a negative relationship between the respondents' education and their adoption of on-line auctions; therefore, H5b was not supported. H5c was confirmed; males had higher odds of adopting on-line auctions than females. This could be explained by more concerns about on-line privacy and higher computer anxiety among female respondents reported by Sheenan (1999) and Jackson et al (2001). Participation in on-line auctions normally requires disclosure of personal financial information. Also, sellers often need to upload pictures of the products onto the auction site, which may discourage females with low self-efficacy on computer skills from participation in on-line auctions.

The relationship between respondents' age and adoption of on-line auctions was hypothesized in the null form; however, there was a negative relationship between these two variables, namely, younger respondents were more likely than older respondents to participate in on-line auctions.

All three on-line characteristics, access location, Internet experience, and Internet connectedness, were significantly related to participation in on-line auctions. The hypotheses related to access location and respondents' adoption of on-line auctions was written in the null form. Analysis showed respondents going on-line from work only or from neither home or work had lower odds of adopting on-line auctions. People with Internet access only from work or public places were less likely to participate in on-line auctions, perhaps because of workplace policies and/or concerns about privacy. As was true for on-line shopping and on-line financial services, experience with the Internet and Internet connectedness were positively related to adoption of on-line auctions. Thus the null hypotheses related to these two variables were not supported. People with more experience with the Internet and higher attachment to the Internet had less concern about on-line privacy and less computer anxiety when they participated in on-line auctions.

This was in line with Rogers' diffusion of innovation theory (1995). Innovators (INs) and Early Adopters (EAs) had the ability to understand and apply complex technical knowledge in their field. However, the inverse relationship between education and adoption of on-line auctions needs further study since according to Rogers, INs and EAs have control of substantial financial resources and career security which are closely related to education level. Perhaps participants in on-line auctions choose that activity because they have relatively low socio-economic status and are tight for money. Internet

users with higher socio-economic status place a higher market value on their time, and thus have higher opportunity costs for engaging in on-line auctions which can be fairly time-intensive. However, some Internet users with higher socio-economic status might still be attracted to on-line auctions for their consumption value. To gain a clearer picture about who participates in on-line auctions and why, further research is warranted.

In addition, users of on-line auctions were younger rather than older. This result also merits further research. Some of the younger consumers may be students who participate in on-line auctions as a means to save money on purchases. However, while income was significantly related to on-line shopping and on-line financial services, it was insignificant for on-line auctions. This is not the result expected. Participation in on-line auctions involves regular checking of bids offered by others and adjustment of one's own bid. People starved for time and those who use the Internet for convenience might be less attracted to this activity. Participants with higher incomes and higher levels of education might value the Internet more for its convenience and be less likely to participate in on-line auctions. The relationship of the income variable to participation in on-line auctions should be further investigated.

The relationships between the demographic variables and each of the dependent variables were not the same. While income was directly related to one's participation in on-line shopping and on-line financial transactions, it was not significantly related to one's participation in on-line auctions. While education was directly related to one's participation in on-line shopping and on-line financial transactions, it was inversely related to one's participation in on-line auctions. While there was no significant difference between males' and females' participation in on-line shopping, males were

more likely to adopt on-line financial services and to participate in on-line auctions. Age's relationship was consistent across the three categories of on-line activities; younger participants were more likely to participate in all three on-line activities. While race had a significant relationship with on-line shopping, its relationships with on-line financial transactions and on-line auctions were insignificant.

In comparison, the relationships between respondents' on-line characteristics and on-line transactions were more consistent. On-line experiences and Internet connectedness were positively related to participation in all three on-line activities. For access location, respondents accessing the Internet from both home and work were more likely to participate in on-line shopping and to adopt on-line financial services than respondents accessing the Internet from home. Respondents accessing the Internet from work only were less likely to participate in on-line shopping and on-line auctions than respondents accessing the Internet from home. Respondents accessing the Internet from neither home or work were less likely to participate in on-line auctions than respondents accessing the Internet from home.

The findings from this study have implications for consumer educators and businesses. While there was no significant difference between females' and males' participation in on-line shopping, males were more likely than females to adopt on-line financial services and participate in on-line auctions. This could be because female participants considered on-line financial transactions and on-line auctions to be more sophisticated on-line activities and to involve more privacy risks and computer and Internet skills. Sheenan (1999) reported females had more concerns about on-line privacy and were less likely to adopt protective measures than males; Jackson et al (2001)

reported females had higher computer anxiety. Consumer educators could design workshops targeting females to help them to learn about the Internet from the basics and to adopt protective measures against privacy risks. Such learning materials could be published in media mainly catering to female audiences.

Businesses could also learn from this study to better target their markets. Since Internet users with higher socio-economic status were more likely to adopt on-line shopping and on-line financial services, relevant Internet sites could advertise their services in magazines mainly targeting this group as the audience. On-line auction sites could make their services more attractive to time-starved consumers by making participation in on-line auctions more convenient. For example, they could send the bidders on-line messages when someone else offers a higher bid or when the bidding deadline is approaching.

Previous literature (Lach 1999) suggests that Asian-Americans were more likely than other races to trade on-line, while this study did not find such a tendency. However, the activity assessed included both on-line banking and on-line trading which may be two different types of transaction activities requiring different amounts of money and Internet skills. It would be useful if further research investigates whether Asian-Americans are Innovators or Early Adopters especially for technically sophisticated products, and whether they have the higher levels of economic resources assumed to be needed to absorb relevant risks.

This study has certain limitations. Unfortunately, the data set did not include any measures of respondents' computer and Internet skills, which might be another variable that would be important in explaining differences in on-line activities. Also, this

research does not measure psychological aspects of respondents, such as attitude toward risks, which could help in predicting the likelihood of respondents to participate in on-line transactions in the future.

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TABLES

Table 1
Summary of Hypotheses Testing

Dependent Variable	Hypotheses	Result
On-line shopping	H1a: Income (+)	Supported
	H1b: Education (+)	Supported
	H1c: Gender (female -)	Not supported
	H1d: Age (+)	Not supported
	H1e: Race (Asian +)	Partially supported
	H2a: Access location	Partially supported
	H2b: Internet experience (+)	Supported
	H2c: Internet connectedness (+)	Supported
On-line financial transactions	H3a: Income (+)	Supported
	H3b: Education (+)	Supported
	H3c: Gender (male +)	Supported
	H3d: Age (-)	Supported
	H3e: Race (Asian +)	Not supported
	H4a: Access location	Partially supported
	H4b: Internet experience	Not Supported
	H4c: Internet connectedness	Not Supported
On-line auctions	H5a: Income (+)	Not supported
	H5b: Education (+)	Not supported
	H5c: Gender (male +)	Supported
	H5d: Age (+)	Not supported
	H5e Race	Not supported
	H6a: Access location (home +)	Partially supported
	H6b: Internet experience (+)	Supported
	H6c: Internet connectedness (+)	Supported

Table 2
Sample Profiles Demographic Characteristics

Demographic Characteristics	All Internet Users (n=3340)	On-line Shoppers (n=1969)	On-line Non-Shoppers (n=1371)	Users of On-line Financial Services (n=829)	Non-users of On-line Financial Services (n=2511)	Users of On-line Auctions (n=281)	Non-users of On-line Auctions (n=1608)
Income							
<$10,000	3.53%	2.73%	4.69%	1.01%	4.37%	3.29%	3.82%
$10,000-20,000	4.93%	4.16%	6.05%	3.56%	5.39%	4.61%	5.02%
$20,000 - 30,000	9.97%	9.36%	10.87%	7.20%	10.90%	9.80%	10.38%
$30,000- 40,000	11.73%	12.24%	11.01%	10.27%	12.22%	15.42%	10.60%
$40,000-50,000	11.49%	10.22%	13.33%	8.70%	12.43%	9.71%	12.50%
$50,000 and more	**42.28%**	**48.48%**	**33.29%**	**57.71%**	**37.18%**	**49.27%**	**40.95%**
$50,000-75,000	19.61%	19.90%	19.05%	19.53%	19.65%	18.56%	18.64%
$75,000-100,000	11.19%	13.73%	7.57%	15.88%	9.61%	15.86%	9.35%
$100,000 and more	11.48%	14.85%	6.67%	22.30%	7.92%	14.85%	12.96%
Missing	16.06%	12.80%	20.76%	11.55%	17.50%	7.91%	16.74%
	100%	100%	100%	100%	100%	100%	100%
Education							
None, or grade 1-8	0.33%	0.23%	0.47%	0.00%	0.44%	0.80%	0.23%
High school incomplete	5.21%	3.66%	7.45%	2.61%	6.07%	4.18%	4.24%
High school graduate	21.16%	16.99%	27.02%	14.92%	23.17%	24.19%	20.09%
Vocational school after high school	5.03%	4.71%	5.51%	6.02%	4.71%	5.56%	3.38%
Some college and more	**68.27%**	**74.40%**	**59.55%**	**76.46%**	**65.62%**	**65.28%**	**72.06%**
Some college	30.96%	31.10%	30.80%	27.54%	32.12%	26.10%	32.82%
College graduate	25.13%	29.10%	19.45%	32.15%	22.85%	26.86%	25.92%
Graduate school	12.18%	14.20%	9.30%	16.77%	10.65%	12.32%	13.32%
	100%	100%	100%	100%	100%	100%	100%
Gender							
Male	50.41%	51.41%	49.06%	56.55%	48.34%	63.95%	48.68%
Female	49.59%	48.59%	50.94%	43.45%	51.66%	36.05%	51.32%
	100%	100%	100%	100%	100%	100%	100%
Age							
18-34	44.20%	44.02%	44.36%	46.86%	43.34%	48.63%	43.94%
35-49	36.17%	37.58%	34.16%	35.98%	36.24%	37.77%	37.27%
50-64	15.50%	15.18%	15.99%	14.99%	15.62%	10.69%	14.30%
65 or older	4.14%	3.22%	5.49%	2.17%	4.79%	2.91%	4.48%
	100%	100%	100%	100%	100%	100%	100%
Mean	37.97	37.75	38.30	37.25	38.20	35.47	38.04
Std deviation	18.98	18.09	20.22	16.92	19.63	17.10	19.20

Table 2 (continued)

Demographic Characteristics	All Internet Users (n=3340)	On-line Shoppers (n=1969)	On-line Non-Shoppers (n=1371)	Users of On-line Financial Services (n=829)	Non-users of On-line Financial Services (n=2511)	Users of On-line Auctions (n=281)	Non-users of On-line Auctions (n=1608)
Race							
White	87.18%	89.54%	83.77%	85.54%	87.75%	91.41%	85.41%
Black	8.39%	5.89%	11.99%	8.28%	8.43%	4.07%	9.94%
Asian	1.46%	1.83%	0.93%	2.56%	1.10%	1.46%	1.80%
Other	2.97%	2.74%	3.31%	3.62%	2.72%	3.06%	2.85%
	100%	100%	100%	100%	100%	100%	100%

Table 3

Sample Profiles - On-line Characteristics

On-line Characteristics	All Internet Users (n=3343)	On-line Shoppers (n=1969)	On-line Non-Shoppers (n=1371)	Users of On-line Financial services (n=829)	Non-users of On-line Financial services (n=2511)	Users of On-line Auctions (n=281)	Non-users of On-line Auctions (n=1608)
Access Location							
Home	46.33%	43.31%	50.76%	35.93%	49.75%	43.94%	45.72%
Work	13.70%	9.62%	19.59%	7.69%	15.70%	5.05%	15.30%
Home and work	34.48%	43.49%	21.61%	54.81%	27.77%	50.47%	33.18%
Neither	5.48%	3.59%	8.05%	1.58%	6.78%	0.54%	5.79%
	100%	100%	100%	100%	100%	100%	100%
Internet experience							
One year or less	**38.30%**	**29.32%**	**51.25%**	**24.40%**	**42.93%**	**21.69%**	**38.43%**
Within the last six month	17.66%	10.92%	27.38%	6.61%	21.33%	6.16%	16.73%
A year ago	20.64%	18.40%	23.87%	17.79%	21.60%	15.53%	21.70%
Two years or more	**61.30%**	**70.55%**	**48.10%**	**75.61%**	**56.53%**	**78.32%**	**61.22%**
Two or three years ago	32.78%	35.74%	28.58%	31.42%	33.20%	34.96%	34.11%
More than three years ago	28.52%	34.81%	19.52%	44.19%	23.33%	43.36%	27.11%
Missing	0.40%	0.12%	0.64%	0.00%	0.53%	0.00%	0.35%
	100%	100%	100%	100%	100%	100%	100%
Internet Connectedness							
2	5.39%	3.52%	8.40%	3.69%	6.00%	1.99%	5.41%
3	3.72%	2.65%	5.45%	2.16%	4.28%	1.52%	4.73%
4	9.32%	6.57%	13.73%	4.44%	11.05%	5.34%	11.07%
5	10.80%	7.98%	15.32%	6.19%	12.37%	8.61%	11.84%
6	17.98%	17.53%	18.71%	15.69%	18.81%	13.70%	17.71%
7 or 8	**52.78%**	**61.76%**	**38.40%**	**67.82%**	**47.48%**	**68.84%**	**49.25%**
7	15.20%	16.40%	13.28%	17.37%	14.45%	12.90%	14.50%
8	37.58%	45.36%	25.12%	50.45%	33.03%	55.94%	34.75%
	100%	100%	100%	100%	100%	100%	100%
mean	6.28	6.64	5.70	6.82	6.09	6.93	6.14
std deviation	2.54	2.32	2.66	2.22	2.59	2.13	2.57

Table 4
Correlation Coefficients among the Independent Variables

	Age	Income	Education	Gender	Race	Access Location	Internet Experience	Internet Connected-ness
Age	1.0000 (.0000)	.2063 (<.0001)	.2088 (<.0001)	-.0445 (.0705)	.1023 (<.0001)	-.0068 (.7810)	.0487 (.0481)	-.0100 (.7008)
Income		1.0000 (.0000)	.2395 (<.0001)	-.1175 (<.0001)	.0586 (.0275)	.0542 (.0416)	.1738 (<.0001)	.0769 (.0059)
Education			1.0000 (.0000)	-.0499 (.0409)	.0291 .2332	.1375 (<.0001)	.2709 (<.0001)	.0994 .0001
Gender				1.0000 (.0000)	-.0210 (.3876)	-.0239 (.3260)	.0966 (<.0001)	.1180 (<.0001)
Race					1.0000 (.0000)	.0144 (.5543)	.0625 (.0103)	.0673 (.0085)
Access Location						1.0000 (.0000)	.07671 (.0016)	.0177 (.4885)
Internet experience							1.0000 (.0000)	.2489 (<.0001)
Internet connected-ness								1.0000 (.0000)

Table 5
Results of Logistic Regression Analysis - On-line Shopping

Independent Variables	Coefficient	Odds ratio	Wald chi-square	p-value
Income	0.1045	1.110	17.3243***	<0.0001
Education	0.1685	1.184	24.5681***	<0.0001
Gender				
Female	-0.0354	0.965	0.1495	0.699
Age	-0.0134	0.987	13.3703***	0.0003
Race(Asian omitted)				
White	-0.3733	0.688	1.3869	0.2389
Black	-0.9920	0.371	8.1316**	0.0044
Other	-0.7405	0.477	3.3457	0.0674
Access Location (home omitted)				
Work	-0.7149	0.489	26.5809***	<0.001
Home and work	0.2884	1.334	7.3060**	0.0069
Neither	-0.3578	0.699	2.2290	0.1354
Internet Experience	0.2801	1.323	37.1363***	<0.0001
Internet Connectedness	0.1980	1.219	58.2334***	<0.0001
Chi-square of Likelihood Ratio	371.9981***			
Model chi-square	306.4071***			
Pseudo R-square 0.1124				

*** P < .001 **P < .01 *P < .05

The pseudo R-square is 0.1124, meaning the independent variables as a whole explain 11.24% of the variance in the log odds ratio.

Table 6
Results of Logistic Regression Analysis - On-line Financial Services

Independent Variables	Coefficient	Odds ratio	Wald chi-square	p-value
Income	0.1876	1.206	46.4087***	<0.0001
Education	0.0876	1.092	5.4628*	0.0194
Gender				
Female	-0.1404	0.869	2.0747	0.1498
Age	-0.0151	0.985	13.3767***	0.0003
Race (Asian omitted)				
White	-0.7553	0.470	7.5010**	0.0062
Black	-0.3342	0.716	1.1012	0.2940
Other	-0.3067	0.736	0.6334	0.4261
Access Location (home omitted)				
Work	-0.2737	0.761	2.4717	0.1159
Home and work	0.5872	1.799	29.7395***	<0.0001
Neither	-0.3897	0.677	1.1045	0.2933
Internet Experience	0.3112	1.365	34.1645***	<0.0001
Internet Connectedness	0.1627	1.177	27.3472***	<0.0001
Chi-square of Likelihood Ratio	336.4400***			
Model chi-square	278.6882***			
Pseudo R-square	0.1128			

*** P < .001 **P < .01 *P < .05

The pseudo R-square is 0.1128, meaning the independent variables as a whole explain 11.28% of the variance in the log odds ratio.

Table 7
Results of Logistic Regression Analysis - On-line Auctions

Independent Variables	Coefficient	Odds ratio	Wald chi-square	p-value
Income	-0.0217	0.979	0.3018	0.5828
Education	-0.1561	0.856	7.6899**	0.0056
Gender				
Female	-0.7766	0.460	26.0133***	<0.0001
Age	-0.0192	0.981	9.0224**	0.0027
Race (Asian omitted)				
White	0.7459	2.108	1.8020	0.1795
Black	0.0269	1.027	0.0018	0.9663
Other	0.2551	1.291	0.1186	0.7306
Access Location (home omitted)				
Work	-0.6916	0.501	5.1025*	0.0239
Home and work	0.3179	1.374	3.6081	0.0575
Neither	-1.8332	0.160	4.7125*	0.0299
Internet Experience	0.2675	1.307	10.2004**	0.0014
Internet Connectedness	0.2493	1.283	24.7322***	<0.0001
Chi-square of Likelihood Ratio	135.5222***			
Model chi-square	109.6383***			
Pseudo R-square	0.1037			

*** P < .001 **P < .01 *P < .05

The pseudo R-square is 0.1037, meaning the independent variables as a whole explain 10.37% of the variance in the log odds ratio.