

Present Use and Future Needs of
Selected Virginia Home Computer Owners

by

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(ABSTRACT)

The study was designed to identify how home computers were being used by 200 selected home computer owners living in Richmond, Virginia. The 1984 study identified the expressed problems these owners experienced using home computers and determined what changes or information the owners believed were needed to use the computer more effectively.

The most commonly used home computer applications were personal word processing, entertainment, and work related word processing. Many home computer owners indicated that no factor had prevented them from using their computer. Those indicating that some factor had prevented their use, reported the high cost of software, the lack of useful software, and unclear or incorrect instructions presented problems.

Males were much more likely than females to be the principal computer user. Consistent with Rogers (1983) diffusion the-

ory, most computer owners did use personal sources during their prepurchase information search.

Statistically significant differences existed between the owners satisfaction with hardware and the number of products and services used and between overall satisfaction and the amount spent on software. Significant inverse relationships indicated that those respondents who spent less on hardware and had less random access memory had higher levels of overall satisfaction than those who spent more on hardware and had more random access memory. Recommendations included methods of individualizing service and assistance for owners after the purchase.

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CHAPTER I- INTRODUCTION

Predictions have been made that by the 21st century home computers will be as common in American households as televisions were in 1984. Until the mid 1970's, when the first home computers (also called personal computers or microcomputers) appeared on the market, computers were used mainly in large businesses, institutions, and government by trained technicians capable of handling the complex machines. In 1971, advances in technology made it possible to put a computer's central processing unit on a semiconductor chip, which produced a very small computer that would sell for a relatively low price of \$2000 or less (Rogers, 1982). In 1983 home computer prices ranged from \$100 to \$3000 and 1984 sales are expected to reach six million ("Computers-should you," 1983).

How are these millions of home computers being used in American households? How have home computer owners expected to use their home computers? Are home computers meeting these expectations? This study investigated these questions and others concerning home computer use.

Home Computer Uses

Several Researchers have investigated computer use in the home. Venkatesh and Vitalari (1983a) found the most common home computer uses fell into five categories: games and entertainment, word processing, education, business management, and home management. Rogers (1982) reported that entertainment and games were the most common home computer uses. Consequently, there are many software packages available for video games, games of strategy and deduction.

Other researchers have also found evidence supporting home computer uses in Venkatesh and Vitalari's other four categories. It has been found that word processing can be used for electronic typing and editing. It is much faster and more efficient than typing because corrections, additions, or deletions can be easily made without extensive retyping ("Computers-should you," 1983).

Computers have been used as a teaching device that allows students, children or adults, to progress at their own pace. Programs have been designed which cover material from kindergarten through post graduate work.

Home computers can also be a means of connecting workers at home with their workplace. Some are able to work at home

by linking the home computer with a mainframe computer where they work (Rogers, 1982). Jack Nilles, director of information technology at the University of California's Center for Future Research, estimates that ten million workers, like writers, educators, accountants and lawyers, who deal with information, are ideally suited for working at home using a computer (Maloney, 1982).

In addition, there are mainframe computers, known as data base networks, which offer information on news, weather, and stock quotations (Johnson and Barton, 1983). These networks, when linked with a home computer, even allow users to shop via computer by ordering products listed with the network.

A variety of programs are available for home management which can be used for electronic filing. Information can be listed, catalogued, stored, and then retrieved by the home computer when needed. These programs can be used to store recipes, stamp, coin, or record collections, names and addresses and other information (Johnson and Barton, 1983). By using a spreadsheet program it is possible to keep financial records for household budgets, charge and checking account balances, and taxes.

Home computers have a great capacity to affect many households. The variety of uses described above illustrate the

modifications possible for entertainment, education, employment, and household financial management.

Trends in Home Computer Purchases and Sales

In 1983 6.9% of U.S. households owned a home computer (Link, 1984). Many households have been able to purchase home computers because advances were made which allowed a central processing unit to be placed on a semiconductor chip. As a result, smaller home computers could be manufactured and prices dropped significantly (Uttal, 1983). Consequently, sales increased rapidly for a period of time. In 1982 only two million home computers were sold, by 1984 sales had increased to five million (Marcom, 1985). Although U.S. per capita income is expected to increase in 1985, over 1984, 1985 computer sales have been expected to drop to 4.5 million. Despite this decrease in sales, many consumers will continue to buy home computers.

Need for the Study

Home computers have become more attractive and affordable for many households as prices have declined. As a result, more households are purchasing computers for use in the home. Relatively little data has been collected concerning how much and for what purposes households are using home computers.

In addition, more information is needed regarding the problems home computer owners have experienced using their computers. Finally, little information is available concerning the desires home computer owners may have to improve their computer use. Two studies previously discussed (Rogers, 1982; Venkatesh and Vitalari, 1983a) were initial attempts to answer some of these questions. Additional research is needed for comparison with these and other studies to determine if the results of earlier studies are supported.

Purpose of the Study

The purpose of this study is threefold. First, to identify how home computers were being used by those owners sampled and their households. Second, to identify problems these owners have experienced using home computers. Third, to determine what changes or information owners believed was needed to use their home computers more effectively. For example, cheaper, more reliable software may be needed for effective home computer use.

The information gained from this research will aid consumer educators, such as those in Cooperative Extension, as well as home computer retailers and manufacturers in providing needed information and changes in home computer systems so home computers will meet consumers expectations more closely.

Such information may include special training and educational materials available from retailers or manufacturers. Possible system changes may include more reliable hardware and software and the development of home computer systems that are easy to learn to operate.

Statement of the Problem

There is a lack of information concerning how home computers are being used and if home computer owners are restricted using their computers. If this is the case, then information is needed regarding the factors owners believe restrict their home computer use. Information is also lacking concerning the changes and additional information owners believe will help them use their home computers more effectively.

Objectives

1. To demographically describe selected home computer owners in Richmond, Virginia in terms of sex, age, education, occupation, income, marital status, the presence of children under 18 in the household, and the presence of employed adults in the household.
2. To identify how home computers were being used in the home.
3. To determine how many hours per week each home computer application was used by individual household members.
4. To determine whether owners expectations, about how the home computer would be used, changed between purchase and the time of the study.

5. To ascertain what factors owners believed prevented them from using their home computer as they had expected.
6. To ascertain what changes owners believed were needed to help them fulfill their expectations.
7. To ascertain what information, education, or training owners believed were needed to help them fulfill their expectations.
8. To determine what information sources were used, by home computer owners before the purchase, to evaluate various computer brands.
9. To determine owners satisfaction with home computer hardware, software, and the overall operation of the computer system.

Definition of Terms

Adopter

A consumer who has purchased a home computer.

Computer Hardware

Those elements such as input devices (keyboard), storage devices (tape recorder or disk drive), central processing unit, joy sticks or game paddles, and output devices (monitor, television, or printer) which make up the physical, material parts of a home computer system.

Computer Software

Coded commands, instructions, and other information that allow the hardware to be used.

Home Computer

Known as a personal computer or micro computer, this is defined as a home computer owned and operated by an individual, as opposed to a business, that is intended for the use of the owner and his or her family (Rogers, 1982).

Home Computer Owner

The most frequent user, over 18, living at home.

<u>Innovation</u>	An idea, object, or practice perceived as new by an individual (Rogers, 1983).
<u>Micro-computer</u>	See Home Computer above.
<u>Personal Computer</u>	See Home Computer above.
<u>Technological Innovation</u>	An innovation that has a material aspect (equipment, products, etc,) as opposed to a software aspect (knowledge, skills, etc.).

Despite the recent introduction and significance of home computers in society, few studies have investigated household adoption and implementation of home computers. The following section is a review of the research related to the adoption and use of home computers.

CHAPTER II- REVIEW OF LITERATURE

The Perfect Information Assumption

To maximize satisfaction, consumers must have perfect information about the products and services they wish to buy. Existing in the real world market is imperfect information.

According to Maynes (1976) there are several reasons why there is imperfect information. First, consumers do not seek relevant information because they believe that markets work better than they actually do. Specifically, consumers believe that a higher price means higher quality, even though this is not always true. The costs associated with information search also prevent consumers from seeking relevant information. This is particularly because time is scarce and therefore, more valuable. Consequently, the cost of time spent searching for information is so high that many consumers are often unable to obtain relevant information mainly because they will forego the information search. In addition, Maynes has contended that consumers are often unable to obtain relevant information mainly because consumer products have become technically complex. Some degree of technical knowledge is sometimes needed to purchase complex products and many consumers lack this knowledge. Finally,

Maynes has asserted that consumers often fail to act on relevant information even when they have it. Maynes believes that some consumers may dislike the conflict involved with bargaining in the marketplace, even though they know bargaining is acceptable. Other consumers may feel that they lack the skills to bargain, even using the information they have about the products and services they wish to buy.

According to Stigler (1961), as the fraction of the consumer's total expenditure on the product increases, so does the amount of savings gained from the information search. Therefore, the consumer will continue to search for more information as the savings increase.

Linder (1970) and Mincer (1963) have argued that as consumers incomes increase and time becomes more valuable, consumers will spend less time in decision making or find a way to search for information which requires less time.

Sproles (1983) pointed out a practical problem with the perfect information assumption. Because consumer decisions draw upon personal values, compromises, and trade offs among intervening constraints, these complexities can cause the ideal of perfect maximization to seem unattainable or unrealistic. Even if perfect information was available, Sproles contends that there would still be difficulties. Shopping and

searching for information are not exciting for many consumers so they may become bored or distracted during the search. Further, due to limited information processing capacities, (e.g. computational skills, reasoning ability, intelligence, and information overload) many consumers will not be able to assess the exact payoff of each alternative.

Heiner (1983) contended that consumers are unable to achieve perfect maximization because they become confused by the complexity of purchase decisions. This confusion leads to uncertainty about how to use available information. Heiner further suggested that increasing the amount of information will not necessarily enhance purchase decisions.

Research from Jacoby, Speller, and Kohn (1974) supported Heiner's argument. The study concerned the effects of increasing information load on brand choice behavior. The product type used in the study was laundry detergent. With this taken into account, this research may have implications for this home computer study. Their results indicated that while consumers felt more satisfied and less confused with increased information for consumer products, they tended to make poorer purchase decisions.

There is a great deal of information available for consumers making purchase decisions about home computers. Information

about buying and using computers can be found in computer magazines, consumer publications, newspapers, television, universities, and many other sources. The research by Heiner (1983), Jacoby, Speller, and Kohn (1974) may suggest that this amount of computer buying information may actually do more harm than good. In other words, despite the availability and use of information, consumers buying home computers may be making poor purchase decisions.

Innovations

An innovation is "an idea, practice, or object that is perceived as new by an individual" (Rogers, 1983, p.11). The discovery or invention of an idea or object at a particular point in time does not necessarily mean that it is an innovation. The perceived newness of an idea for an individual determines its classification as an innovation. The micro-computer is a recent innovation for many households. In fact, only since 1981 have home computers become relatively popular in the U.S. (Venkatesh and Vitalari, 1983a). Smaller, less expensive computers have been available since the early 1970's, but many consumers have only recently become aware of this innovation.

Characteristics of Innovations

The adoption rate for innovations is associated with several characteristics which are perceived by individuals. Rogers (1983) described five innovation characteristics: 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability, and 5) observability.

Relative advantage is the degree to which an innovation is perceived as superior to the idea it supercedes. For example, when using a home computer to maintain household financial records, the relative advantage may be perceived as the increased efficiency over pencil and paper. The second characteristic, compatibility, is the degree to which an innovation is consistent with the existing values, past experiences, and present needs of potential adopters. The third characteristic, complexity, is the degree to which an innovation is perceived as hard to use or understand. Trialability is the degree to which an innovation can be experimented with prior to adoption. Finally, observability is the degree to which the results of the innovation can be seen by others.

Rogers (1983) asserted that innovations which are perceived to have a relative advantage, compatibility, trialability,

observability, and less complexity are adopted at a faster rate than other innovations.

Previous Experience with Related Products

Evidence has been cited which indicated that prior experience with other products, in the same category as an innovation, may have an effect on adoption rates. Taylor (1977) found a significant positive relationship between prior experience with a product class and time of adoption. Based on this, Hirschman (1980) suggested that prior experience with a product may lead to greater ability to detect superior new products which contribute to the probability that they will be adopted. Dickerson and Gentry (1983) found that home computer adopters had more experience with a variety of technical products and services than non-adopters.

Innovation Decision Process

Rogers (1983) defined the innovation decision process as the process through which an individual goes from first knowledge of an innovation to the decision to adopt or reject. Rogers identified five steps in this process: 1) knowledge, 2) persuasion, 3) decision, 4) implementation, and 5) confirmation.

Knowledge, the first step, occurs when an individual becomes aware of an innovations existence and has some understanding of its functions. This is followed by persuasion, when an individual actively looks for more information and forms a favorable or unfavorable attitude toward the innovation. Then, in the next step, a decision is made to adopt or reject the innovation. During the implementation process an individual puts the innovation to use. Finally, confirmation is made when an individual seeks reinforcement for the decision. If there is no reinforcement the decision may be reversed.

Communication Channels

Diffusion is a particular type of communication in which the information that is exchanged is concerned with new ideas or innovations (Rogers, 1983).

A communication channel is the method by which messages get from one individual to another. There are several types of communication channels. For example, a mass media channel is a means of transmitting messages that involve a mass medium, such as radio, television, newspapers, or magazines. Interpersonal channels involve a face to face exchange between individuals. According to Rogers (1983), interpersonal channels are more effective than mass media at the persuasion

stage of the diffusion process, particularly if the channel links two or more individuals who are near peers.

Why Innovations Are Adopted

In most cases it is assumed that an innovation is adopted so that the direct benefit associated with it may be gained. For example, most consumers who adopt home computers do so in order to gain the benefits of owning and using a computer, i.e. keeping efficient financial records, to do word processing, etc. However, according to some research, innovations have been adopted for reasons other than direct technical or economic benefits. Rogers, Mitchell, and Kendrick (1961) studied the purchasing behavior of farmers buying new machinery. Their results indicated that many farmers bought new machinery because of the social prestige associated with owning certain new machinery in addition to the economic and technical benefits.

In a similar discussion, Hirschman (1981) argued that innovations may be adopted for two reasons: technology and symbolism. According to Hirschman, technological innovations may be adopted primarily because of their performance characteristics and the consumers need for technical usefulness. Symbolic innovations may be adopted because of the symbolic meaning or intangible attributes (prestige, conservatism,

etc.) associated with them. Not all innovations fit neatly into one category or another. According to Hirschman (1981, p.537), "in actuality both dimensions are continuous and may be interrelated for some product classes."

The work of Rogers, Mitchell, and Kendrick (1961) and Hirschman (1981) both suggested that home computers cross over to each of these dimensions offering both technical or economic benefits as well as symbolic benefits.

Characteristics of Adopters

Rogers (1983) has indentified five adopter categories on the basis of innovativeness: (1) innovators, (2) early adopters, (3) early majority, (4) late majority, and (5) laggards.

Innovators are the first individuals to adopt an innovation. The major characteristics associated with innovators are venturesomeness, riskiness, and daring. Early adopters, the the second group to adopt a new idea, are respected by their peers, and have the greatest amount of opinion leadership. Early adopters, because they are not too far ahead of the average individual in innovativeness often serve as role models for their peers. According to Rogers, both innovators and early adopters tend to have high incomes and educations. The early majority adopt just before the average citizen.

These individuals are an important link between early adopters and relatively later adopters in the diffusion process. The early majority interact frequently with peers, but do not often hold leadership positions. The time spent in the decision process is relatively longer than for innovators or early adopters. The late majority adopt new ideas just after the average individual. Adoption may result from economic necessity and increasing pressure from peers. The weight of societal norms favoring an innovation is necessary to persuade the late majority to adopt. Laggards are the last individuals to adopt an innovation. They often make decisions based on what has been done by previous generations rather than on changes coming in the future (Rogers, 1983).

Rogers (1983) has also compiled a summary of diffusion research based on several variables related to innovativeness, one of which is socio-economic characteristics. According to this summary, earlier adopters have higher levels of education than later adopters. This may be related to the need to be able to understand and use complex technical information associated with some innovations. Rogers also found that earlier adopters have higher social status than later adopters. Income is one variable that contributes to social status, therefore earlier adopters may tend to have higher incomes than later adopters because they have the financial resources to absorb the loss of an unprofitable innovation.

Characteristics of Adopters of Technological Innovations

Several studies have investigated the adoption of technological innovations. Some concentrated on the profile development of consumer innovators. Labay and Kinnear (1981) found that adopters of residential solar energy systems were younger, more highly educated, had higher incomes and occupational status than the general population. When comparing the perceptions of adopters with perceptions of the general population sample, Labay and Kinnear found adopters evaluated solar energy systems as less socially risky, less financially risky, less complex, more compatible with their personal values, and less observable by others than non-adopters. Rogers (1983) has indicated that innovations which are perceived to have relative advantage, compatibility and less complexity are adopted at a faster rate than other innovations. Therefore, it is possible that those who perceive an innovation as having these characteristics are more likely to adopt. The results from a study investigating the adoption of home computers (Dickerson and Gentry, 1983) indicated adopters were older, had more education and higher incomes and were more likely to be homeowners than nonadopters. This study also indicated that adopters had more experience with technical products than non-adopters. This finding was consistent with Rogers (1983) assertion that the more compatible an innovation is with the potential

adopters past experiences, the more likely it will be adopted.

Home Computer Adoption and Use

A number of studies have investigated the adoption of different types of technological innovations, but few have examined home computer adoption and implementation. The study by Dickerson and Gentry (1983) discussed earlier, focused upon characteristics of adopters not the actual adoption or implementation. Following is a discussion of two studies that have addressed this void.

Rogers (1982) surveyed 77 home computer owners in Silicon Valley households in Northern California. Of the respondents in the non-random sample of home computer owners the majority (84%) were male, almost one-third held Ph.D degrees, and one-fifth were employed as scientists and engineers. Average personal income was \$38,000 and the average age was 36. According to Rogers, this sample may have been representative of home computer owners in Silicon Valley, but it was not typical of the U.S. population.

Rogers (1982) found respondents reported an average of 17 hours of computer use per week. The results also indicated entertainment and word processing were the most common uses.

More than half (64%) of the respondents had encountered serious or minor problems using their computer. Bad documentation, breakdowns, and lack of useful programs accounted for over 80% of minor problems. Rogers also reported that after an adjustment period of about one month owners became comfortable with their computer. Overall, about 86% of those surveyed were satisfied with their computer.

When asked how they first became aware of home computers, over half of the respondents said they first heard about computers from interpersonal information sources such as work associates, friends, and family members. According to Rogers, this indicates interpersonal networks are more important in providing awareness and knowledge for these respondents than are media sources. This is inconsistent with most diffusion studies which have reported mass media channels are more important for awareness and knowledge stages of the innovation and diffusion process (Rogers, 1983).

Venkatesh and Vitalari (1983a) also investigated home computer adoption and usage. The respondents consisted of 282 home computer owners from selected computer clubs on Orange County, California. Demographically, these computer owners were similar to those in the Rogers (1983) study. Venkatesh and Vitalari reported that almost all of the respondents were male (95%), and 60% had completed a college degree. The av-

erage age was 38, and over 70% of the respondents had an income of \$30,000 or more. Sixty-five percent were employed in technical, managerial, or professional positions.

When asked about specific computer uses, 71% had a specific use in mind before the purchase. Venkatesh also reported that hobbies/education, business applications, and financial/home management were the three most common intended uses. The three most common actual uses were word processing, business applications, and entertainment.

The majority of respondents were satisfied with hardware reliability (79%) and software reliability (63%). More than half (52%) were not satisfied with the compatibility of different manufacturers hardware and software components. Almost one-fourth of those surveyed were not satisfied with the documentation or instructions for general systems. Venkatesh and Vitalari also reported that satisfaction was related to previous experience using computers. Those respondents who had previous experience were more satisfied with various computer related factors, such as hardware and software reliability, than those without previous experience. Levels of satisfaction were also obtained for respondents with or without previous experience according to length of ownership. Those with previous experience in the first year of ownership have higher levels of satisfaction for such factors as hard-

ware and software reliability, time required to enter data, dealer helpfulness, and standardization of manufacturers products than those without previous experience. Length of ownership reportedly had little effect on actual use. Respondents were asked to indicate their attitude toward computers through a list of bipolar adjectives such as complex/not complex, awkward/not awkward, helpful/not helpful, etc. Generally most respondents reported favorable attitudes toward computers with one exception. Almost half (44%) of those surveyed felt computers were complex machines.

"Consumer Reports" magazine (How our readers, 1983) surveyed 2800 of their readers who had purchased a home computer in 1982 or earlier. Their results indicated that almost half (46%) of their respondents bought their computer for home use only and 41% bought a home computer for both home and business use. The study also revealed that the average family in the survey used the computer about 15 hours a week. The four most common computer applications were games, learning about computers, learning programming, and word processing.

Link (New Media, 1984) surveyed 4,000 consumers, nationwide, to investigate ownership of several electronic media devices, including home computers. Link reported that 6.9% of all U.S. households owned a home computer. Link surveyed 280 home computer owners as part of the study. Their results

indicated that the head of the home computing household was 38, had a college degree, was in a professional or managerial work position, and had an annual household income between \$30,000 to \$35,000. Almost half of the home computer owners surveyed used their computer every day and almost 60% used their computer for more than two hours a day. The most common applications were games, programming, filing and storing information, and education.

All of the studies discussed above (Rogers, 1982; Venkatesh and Vitalari, 1983a; How our readers, 1983; New Media, 1984), found that word processing and entertainment were among the most common computer uses. This may be because each of these functions require relatively low level skills so they are considered to be less complex than other applications. Venkatesh and Vitalari (1983a) found that financial management ranked last in the actual list of uses. This low level of use could be attributed to the perceived complexity of this application.

Problems After Purchase

Despite the wide range of uses for computers, the increased sales, and decreased prices, some computer buyers have been disappointed when they found how difficult it could be to use their computer for more complex applications like home man-

agement (Petre, 1983). In their frustration and disappointment, many families may have packed their computer away, considering it a useless machine.

Rogers (1982) surveyed home computer owners of Silicon Valley households in Northern California concerning their experiences with home computers. The results indicated over 60% of the respondents had serious or minor problems using their computer. According to Rogers (1982), some had difficulty learning to use the system. This may be due to unclear or inadequate instructions. Other respondents indicated that useful software was unavailable while others encountered frequent system breakdowns. In a similar study Venkatesh and Vitalari (1983a) reported that more than half of their respondents were not satisfied with the compatibility of hardware and software components. Some or all of these factors may prevent owners from using their computers for the purposes originally intended.

Consumers Union (1983) surveyed 2800 of their readers and reported that a common complaint among respondents was the poor quality of computer instruction manuals. These home computer owners indicated their manuals were incomplete, unclear, or lacked detail.

Consumer Satisfaction/Dissatisfaction

In addressing the concept of consumer satisfaction, many people may think of an evaluation of a product or service. Westbrook and Oliver (1981) suggested that in addition to an association with the purchase of products and services, satisfaction may also be related to shopping at retail stores and possibly to overall participation in the marketplace. According to Westbrook and Reilly (1983), an attitude is an evaluation of a product or service and satisfaction is an evaluation of a consumer's purchase and consumption experience. This definition of satisfaction will be used in this study to define owners satisfaction. Hunt (1977), also referred to satisfaction as an evaluation of an experience. Even so, there are other researchers who do not define satisfaction in terms of experience evaluation. For example, Engel and Blackwell (1982) conceived satisfaction as an evaluation that the purchase choice is consistent with prior beliefs regarding that choice. Howard and Sheth (1969, p. 145) defined satisfaction as "the buyers cognitive state of being adequately or inadequately rewarded for the sacrifices he has undergone."

Research in the area of satisfaction measurement has received a lot of attention. A study by Oliver (1980) indicated that the use of a Likert format multi-item rating scale had a high

level of internal consistency. Westbrook and Oliver (1981) contended that the use of single item rating scales were inadequate because such measures may have been biased because of too few scale increments and the lack of evaluative anchoring along the scale. Their investigation of the suitability of five selected consumer satisfaction measures lends support to this contention. Similarly, Kennedy and Thirkell (1982) reported that the use of a multi-item scale to measure satisfaction was adequately reliable and valid, and provided a more sensitive measure of overall satisfaction levels than traditional single item scales.

However, other research has failed to confirm the superiority of multi-item scales over single item scales. In another study, Oliver and Linda (1981) compared two satisfaction measures, one overall measure and one which summed the measures of nine separate attributes. They concluded that the overall scale was a better measure than the summed scale because there was no internal consistency on the summed measures. They gave the explanation that product attributes hold different levels of importance for individual consumers. Therefore, a significant attribute for one consumer might be meaningless to another.

Another issue involving consumer satisfaction concerns the various factors that affect levels of consumer satisfaction.

Day (1976) classified consumer expectations into three categories: 1) expectations about the performance of the product or service, 2) expectations about the costs and efforts which will be expended in obtaining the direct benefits of the product or service, 3) expectations of social benefits and costs resulting from the purchase. Day also mentioned several product types, which because of their complexity, make the consumer's evaluative task more difficult. These included: a product which is used over a considerable amount of time so the evaluation is continuous over time and the consumer's feelings about the product may vary over time; a complex product that has many different features, some satisfactory and others unsatisfactory; and complementary products which are purchased separately and used together so that independent evaluation is difficult. Miller (1977) contended that consumer expectations differ over time. Therefore, consumers gaining different levels of expertise may have different perceptions of the outcomes of the expectations/performance comparison process.

It is evident from the above discussion that consumer expectations impact heavily on satisfaction and dissatisfaction. The following discussion reviews this narrower concept of expectations and their effect on behavior.

Consumer Expectations

According to Katona (1960), expectations denote attitudes about the future. These attitudes can influence behavior. Katona defined attitudes as viewpoints with an affective connotation. Attitudes are emotionally colored points of view which may influence behavior, regardless of whether they are based on rational arguments or held without clear awareness of their reasons. Further, Katona defined expectations as a subgroup of attitudes. They too are intervening variables which influence behavior. Expectations are those attitudes which extend the time perspective into the future. These subjective notions of things to come are influenced by approval or disapproval, and satisfaction or dissatisfaction. Expectations are expressed intentions to act in a certain way as well as notions about what will happen to the person holding the expectations. These expectations are current information which represent attitudes held at the time they are expressed.

Research by Katona (1960) indicated that attitudes are not static; attitudes change over time. Katona (1960) found that the acquisition of information resulted in attitude change. His research indicated that changes in expectations were due either to the acquisition of information or to personal experiences. Therefore, as a home computer owner learns more

about the computer and what it is capable of, their expectations may change from what they were at the time of purchase. In the same way, a consumer's personal experience with the computer, either success or failure, may cause their expectations to change.

In a related discussion Katona (1960) mentioned the theory of operations. According to Katona, traditional theory holds that once needs have been gratified, consumers reach an equilibrium point. At this point their motivation or aspiration for success is reduced. Katona contrasted this with an alternative theory proposed by Lewin. This alternative, a theory of aspiration levels, suggested that aspirations are not reduced with gratification. Katona formulated several generalizations concerning this behavior. Two are pertinent to this discussion: 1) aspirations are not static, they are not established one time to last forever, 2) aspirations tend to grow with achievement and decline with failure.

This theory is applicable to many situations. For example, a computer owner who has just purchased a home computer strives to achieve some goal (e.g. successfully run a word processing program) and reaches this goal. This achievement will bring satisfaction and contentment, but after the goal has been reached the consumer's outlook may change. According to Lewin's theory, this initial achievement may lead the

consumer to strive for more success using the computer. The initial gratification may create new and higher ambitions so the level of aspiration increases with each accomplishment. On the other hand, if the initial attempt to run the word processing program fails, the consumer may never attempt to use any advanced applications.

CHAPTER III- METHODOLOGY

The Survey Population

The sample selected for this study consisted of 988 subscribers to "Personal Computing" magazine, living in Richmond, Virginia. The subscription list was purchased from the magazine's publishing company after a copy of the instrument and a summary of the purpose and procedures had been submitted.

Nationally, subscribers to "Personal Computing" had an average annual household income of \$62,100, the average age was about 40 years, and over half (51%) were male. Approximately 83% were in professional or managerial occupations, 84% owned their own home or condominium, and over 90% attended college. The demographic characteristics of these subscribers were higher on most factors than citizens of Richmond, Virginia. Census data from 1979 revealed that in Richmond the median age was about 30 years, mean household income was almost \$18,000, about 25% of those employed were in professional or managerial occupations, and almost one-third were in technical, administrative, or sales positions (U.S. Department of Commerce, 1983).

Richmond, Virginia was chosen for the survey site because of its size and proximity to the researcher.

Development of the Instrument

Despite the recent impact home computers have had on U.S. households, few investigations of computer adoption and use have been made (Rogers, 1982; Venkatesh and Vitalari, 1983; Dickerson and Gentry, 1983; "Computers-should you", 1983). Further, no investigations, that the author is aware of, have been made concerning what home computer owners believe prevent them from fully utilizing their computer or what owners believe will remedy this situation. To further explore these concepts and others, a mail survey was developed. Portions of other questionnaires (Rogers, 1982; "Computers-should you", 1983) were modified for use in this study. In addition, a pretest of 18 home computer owners, in the Blacksburg, Virginia area, was conducted in an effort to test the questionnaire and the questions. Revisions were made according to the findings of the pretest.

The names of respondents for the pretest were obtained from three sources. A list of participants in a beginners computer class at the local universtiy, and a list of customers from a local computer retail store were used. In addition, the owners who were contacted from these first two sources

were asked to recommend the names of other computer owners who would be willing to participate in the pretest.

The survey of Richmond home computer owners ascertained:

1. Specific applications for which home computer owners were using their computer.
2. The number of hours per week each application was used by each household member.
3. Whether owners expectations, concerning how the computer would be used, changed between the purchase and the time of the study.
4. What factors owners beleived prevented them from using their computer as they had expected.
5. What changes owners believed were needed to help them fulfill their expectations.
6. What additional information, education, or training home computer owners believed were needed to help them fulfill thier expectations.
7. What information sources were used by computer owners before the purchase.
8. How satisfied owners were with computer hardware, software, and the overall operation of the computer system.

Data Collection

Before data collection could begin it was necessary to remove from the subscription list those subscribers which were schools, businesses, libraries, etc., so that only the names of private citizens remained. After this initial elimination process there were 774 names on the list which were potential respondents. To determine whether or not the subscribers

owned a computer the first item on the survey was a screening question used to obtain this information. Any respondent who did not own a computer was asked to indicate this on the questionnaire and then to return it uncompleted in an enclosed, addressed envelope, to the researcher. In the event that more than one computer was owned, respondents were instructed that the questionnaire applied only to the most recently purchased computer. In an attempt to increase response rates, respondents were notified that they could receive a summary of the results.

The data were collected during October, November, and December of 1984. On October 9, questionnaires were mailed out to 774 "Personal Computing" subscribers, living in Richmond, Virginia. Included with each questionnaire was a cover letter and an addressed stamped envelope. Each questionnaire was marked with a number which was used to check off the respondents as they returned their surveys. A follow up postcard was mailed out to all 774 subscribers one week later on October 16.

By December 6, 397 (51%) surveys had been returned. Two hundred and forty (60%) of the respondents indicated they owned a home computer and 149 (38%) did not own a home computer. Six (1.5%) of the surveys were invalid because they

were blank or they did not indicate if a computer was owned and two (.5%) were returned as rejections.

Two hundred (83%) of the 240 surveys indicating ownership were usable. Forty of these questionnaires were not usable because the respondents did not meet the minimum ownership requirement (six months), the respondent was not 18 years old, or the questionnaire contained a high number of unanswered questions.

Difficulties encountered during the mailout period may have resulted in a reduced response rate. The questionnaire and cover letters were mailed out with third class postage while the reminder postcards were mailed out with first class postage one week later. In most cases third class mail moves slower than first class mail. Consequently, several postcards arrived before, on the the same day of, or soon after the questionnaire. This may have caused some potential respondents to become confused, frustrated, or irritated and refuse to return the survey.

Data Analysis

In order to meaningfully interpret the data collected, each item on the survey was descriptively analyzed to provide frequencies, percentages and means.

Oneway analysis of Variance was used to test the following hypotheses:

Hypothesis 1

There is no difference in owners level of satisfaction with hardware, software, and their overall satisfaction, and the number of interpersonal and media information sources used.

Day (1976) asserted that consumers expectations about the performance of a product and about the costs and efforts necessary to obtain the products benefits may affect the consumers level of satisfaction. Based on this argument it was assumed in this study, that consumers who used several information sources knew what kind of performance to expect from a product and what costs and efforts would be required for its use. Therefore, consumers who used more information sources would be expected to be more satisfied than those who used fewer.

Hypothesis 2

There is no difference in owners level of satisfaction with hardware, software, and their overall satisfaction and the number of products and services used.

According to Rogers (1983) an innovation which is more compatible with potential adopters past experiences is more likely to be adopted than one that is less compatible. It was assumed, therefore, that those computer owners who used other products and services would have higher levels of sat-

isfaction because computers were more compatible with their past experiences.

Hypothesis 3

There is no difference in owners level of overall satisfaction and the amount spent on hardware.

Hypothesis 4

There is no difference in owners level of overall satisfaction and the amount spent on software.

Engel and Blackwell (1982) suggested that one result of consumer satisfaction is repeat purchase. Based on this principle, Venkatesh and Vitalari (1983a) hypothesized a relationship between levels of satisfaction and expenditures on computer hardware and software. Their results indicated there was a relationship between additional expenditures on hardware and satisfaction with several computer related attributes.

Hypothesis 5

There is no difference in owners level of overall satisfaction and the amount of random access memory.

Sharpe (1969) has suggested that the size of computer memory may be associated with computer effectiveness. Venkatesh and

Vitalari (1983a) interpreted this to mean that greater effectiveness would lead to greater satisfaction. Their research indicated there was a positive relationship between memory size and the levels of satisfaction with hardware reliability, satisfaction with software reliability, and satisfaction with the time needed for data entry.

For each hypothesis, statistical significance was set at .05. This level was chosen to avoid being too stringent in determining the association between variables.

Hypothesis 6 was tested using a two tailed T-test.

Hypothesis 6

There is no difference in income levels for home computer owners and the Richmond, Virginia population.

Studies investigating home computer ownership have consistently shown that owners have higher incomes than the general population (Rogers, 1982; Venkatesh and Vitalari, 1983a). These findings have been attributed to two factors by Rogers (1983). First, home computer owners are not likely to be typical of the general population because they have been innovators and early adopters. Second, home computer owners may tend to have higher incomes because they have the resources to finance the investment.

The statistical significance for this hypothesis was set at .05. This level was chosen to avoid being too stringent in determining the association between the variables.

Limitations of the Study

1. This study was concerned only with computer owners who subscribed to "Personal Computing" magazine, and lived in Richmond, Virginia. This restricted the extent to which the results could be generalized to other home computer owners.
2. The sample which was surveyed was a convenience sample and was not chosen on the basis of representativeness to other computer owners.
3. The data were collected at one point in time.
4. Respondents were asked to recall past behavior which may have been inaccurate.
5. Respondents were asked to report past behaviors on a self-administered instrument. Truthfulness of responses was assumed because confidentiality was assured.
6. There was no follow up study of nonrespondent differences.
7. Some respondents chose not to answer all of the questions. Therefore, the total N for some questions was less than 200.
8. The types of products and services listed in question seven of the survey may not have been considered in the same class as home computers.

CHAPTER IV- RESULTS AND DISCUSSION

The purpose of this study was to identify how personal computers have been used in selected Richmond, Virginia homes. In addition, the study investigated problems owners had experienced in using their computers and the changes and information owners desired for more effective use.

The data was collected by mail during October, November, and December, 1984, from 200 home computer owners living in Richmond, Virginia. These owners were subscribers to "Personal Computing" magazine.

Results

Home Computer Owners

The results of the survey indicated that the typical home computer owner was male (81%), 40 years old or younger (56.7%), had some college education or completed college (49.2%), had a professional occupation (52.3%), and had an annual household income between \$25,000 and \$55,000 (78.8%) (Tables 1-4). (For more detail regarding other demographic characteristics see Tables 1-4, Appendix A.)

Table 1
Age of Respondents in Home
Computer Survey

N=199¹

	Number	Percent
18-25	16	8.0%
26-30	17	8.5
31-35	40	20.1
36-40	40	20.1
41-45	25	12.6
46-50	22	11.1
51-55	15	7.5
56-50	10	5.0
61-81	14	7.0
*Total ¹	199	99.9%

Mean=40.8

*Totals may not equal 100% due to rounding

¹Some respondents chose not to answer all of the questions. Therefore, some total N's may not equal 200.

Table 2

Education of Respondents in the Home Computer Survey

N=199

Level of Education	Number	Percent
Some grade school	0	0.0%
Completed grade school	2	1.0
Some high school	3	1.5
Completed high school	11	5.5
Some college	55	27.6
Completed college	43	21.6
Some graduate work	33	16.6
Graduate degree	52	26.1
*Total	199	99.9%

*Totals may not equal 100% due to rounding.

Table 3

Occupation of Respondents in the Home Computer Survey

N=197

Occupation	Number	Percent
Professional	103	52.3%
Skilled/semiprofessional	62	31.5
Less skilled	8	4.1
Retired	10	5.1
Homemaker	1	.5
Student	12	6.1
*Total	197	100.1%

*Totals may not equal 100% due to rounding.

Table 4

Annual Household Income of Respondents in the
Home Computer Survey

N=194

Annual Household Income	Number	Percent
Less than \$15,000	10	5.2%
\$15,000-\$24,999	20	10.3
\$25,000-\$34,999	36	18.6
\$35,000-\$44,999	47	24.2
\$45,000-\$54,999	31	16.0
\$55,000-\$64,999	11	5.7
\$65,000-\$74,999	12	6.2
\$75,000 or more	23	11.9
Refusal	4	2.1
*Total	194	100.2%

*Totals may not equal 100% due to rounding.

Home Computer Ownership

Several factors concerning home computer ownership were addressed. These included computer brand ownership, reason cited for brand purchase, length of ownership, and the primary computer user in the household.

The survey results indicated that the top three computer brands owned by respondents were Commodore (14.1%), IBM PC (13.6%), and Apple IIe (12.1%). The remainder owned other brands (Table 5, Appendix A). Over sixty percent (66.5%) of the owners based the selection of a computer brand on price, 54% based their selection on software availability, and the size and reputation of the manufacturer (43.5%) (Table 6, Appendix A). Over ninety percent (93.8%) of those surveyed indicated they purchased their computer within the past three years and 35.7% owned their computer for one to two years (Table 7, Appendix A). More than three-fourths (79.8%) of the respondents considered themselves to be the primary computer user when the computer was purchased (Table 8, Appendix A). (For more information concerning home computer ownership see Table 9, Appendix A).

Computer Expenditures, Memory Size, and Peripheral Ownership

Respondents also provided information regarding hardware and software expenditures. The results indicated that the amount spent on hardware and peripherals was well distributed across a range from zero to over \$4,000, as shown in Table 5. Almost one-third (31.2%) of the respondents spent \$800 or less, while 26.1% spent between \$800 and \$2,000. Thirty percent of those surveyed spent between \$2,000 and \$4,000 and the rest spent over \$4,000. Over eighty percent (85.4%) of the owners indicated they bought some software since the purchase of the computer. Of these respondents, 34.3% spent \$150 or less on software, 27.6% spent between \$150 and \$400, and 37.9% spent over \$400 (Table 6).

Those owners who responded were also asked questions concerning the computer system's random access memory (RAM) and peripheral equipment. Almost one-fourth (24.2%) of the respondents indicated they had 49K of RAM or less, 43.7% had between 49K and 64K, and 31.6% had 81K or more (Table 10, Appendix A). In addition, the respondents indicated which peripherals were purchased at the same time as the computer and those that were purchased after the computer (Table 11-12, Appendix A). The results indicated that the majority of the owners (64.6%) purchased a floppy disk drive with the computer, a monitor (58.5%), and a printer (45.7%). Of those

Table 5

Amount Spent on Hardware by Respondents in the
Home Computer Survey

N=192

Hardware Expenditures	Number	Percent
\$400 or less	40	20.8%
\$401-\$800	20	10.4
\$801-\$1,200	22	11.5
\$1,201-\$1,600	12	6.3
\$1,601-\$2,000	16	8.3
\$2,001-\$3,000	30	15.6
\$3,001-\$4,000	28	14.6
More than \$4,000	24	12.5
 Total	 192	 100.0%

Mean=\$2259.75

Table 6

Amount Spent on Software by Respondents in the
Home Computer Survey

N=166

Software Expenditures	Number	Percent
\$50 or less	17	10.2%
\$51-\$100	22	13.3
\$101-\$150	18	10.8
\$151-\$200	18	10.8
\$201-\$300	10	6.0
\$301-\$400	18	10.8
\$401-\$600	25	14.5
Over\$600	39	23.4
*Total	166	99.8%

Mean=\$637

*Totals may not equal 100% due to rounding.

who bought peripherals after the computer purchase, 71.2% bought a printer, 68.7% purchased a floppy disk drive, and 63.6% purchased a monitor.

Patterns of Home Computer Use

This section reviews the results of the questionnaire items regarding actual home computer use, expected use at purchase, changes in expectations, hourly computer use, and previous computer experience.

The owners reported using the computer for personal word processing (58.4%), entertainment and games (52.1%), work related word processing (50%), and to learn programming (47.4%) (Table 13, Appendix A). Respondents also reported that at the time of the computer purchase they expected to use the computer to learn programming (63%), for entertainment and games (62.5%), and personal word processing (60.5%) (Table 14, Appendix A). (For more information concerning home computer use see Tables 15-16 Appendix A).

According to these results, expected use at purchase and respondents actual use were very similar. Personal word processing, entertainment and games, and learning to program were each mentioned in the top four uses in both time periods (Table 7).

Table 7

Comparison of Actual Computer Use and Expected
Computer Use of Respondents in the Home Com-
puter Survey

N=190

Computer Use	Actual Use Rank	Expected Use Rank
Personal word processing	1	3
Entertainment	2	2
Work related word processing	3	7
Learning programming	4	1
Home budgeting/accounting	5	5
Learning aid	6	4
Work related accounting	7	9
Data base access	8	8
Other	9	11
Write programs to sell	10	10
Learning about computers	-	6

In addition to reporting actual and expected computer use, respondents indicated whether their expectations regarding computer use had changed since the computer purchase. Almost three-fourths (71.4%) of the owners said their expectations had not changed since the purchase. These responses were consistent with the answers to two previous questions discussed which indicated there was little change between the respondents expected use at purchase and actual computer use.

Household Hourly Computer Use

The third section of the survey dealt with the number of hours per week each household member used the computer. Respondents completed a table which included the sex and age of each household member who used the computer. In addition, respondents provided information indicating the average number of hours per week each household member spent using seven computer applications which were listed on the questionnaire. Additional space was provided to include other applications that may have been used by household members but were not listed on the questionnaire.

Respondents were asked to list themselves on the first line of the computer use table. Respondents sex and age were discussed in the demographics section of this chapter, and therefore will not be repeated here.

The results indicated that respondents tended to use each of the seven listed applications one to two hours per week or a total of one to ten hours per week for all the applications (Tables 17-24, Appendix A). The listed applications included: entertainment, learning aid, personal and work related word processing, personal and work related accounting and data base access. The second household computer user used the computer about one to two hours per week for games, as a learning aid, and for personal word processing or a total of five to ten hours per week (Tables 25-28, Appendix A). The majority of this group were male (52.7%) and under 17 years of age (47.7%) (Table 29 Appendix A).

As mentioned above, the respondent and the second household member used most of the applications about one to two hours per week. The remaining household members appeared to use the computer very little. This was consistent with the results concerning the main computer user in the household. In part one of the questionnaire, respondents were asked to indicate which household member was considered to be the main-user when the computer was purchased. The majority (79.8%) of the respondents reported that they were the main-user.

Four categories of use for the second household member had a total N of 30 or less. Therefore, the time spent using these

applications were not reported. The remaining household members listed, on the hours per week table, also had a total N of 30 or less (15%). Therefore, these statistics will not be reported.

About fifteen percent (15.3%) of the households in the home computer survey used the computer one to four hours per week, while a somewhat larger group (21.6%) used the computer five to eight hours, and 17% used it nine to 12 hours per week (Table 8). Summing the data indicated that over half (53.9%) of the households used the computer 12 hours per week or less.

Respondents were asked to indicate whether or not they had experience using a computer before their computer was purchased. Over three-fourths (78%) of the owners reported having previous computer experience. (For more information concerning respondents previous experience see Table 30, Appendix A).

Problems Associated with Home Computer Use

This study was designed, in part, to determine if respondents home computer use has been restricted and if so, to identify what factors they believed were causing the restricted use. In addition, the owners were asked what changes they believed

Table 8

Total Weekly Computer Use of Households in the
Home Computer Survey

N=176

Hours	Number	Percent
1-4	27	15.3%
5-8	38	21.6
9-12	30	17.0
13-16	27	15.3
17-20	14	8.0
21-30	22	12.5
31-40	7	4.0
41-50	4	2.3
51-99	7	4.0
Total	176	100.0%

Mean=16 hours

would improve their computer use and if any additional training, information, or education could be provided to improve computer use.

The results indicated that 39.6% of those surveyed said there were no factors which prevented them from using their computer as they had expected (Table 9). Of those who reported their computer use had been hampered, 28.1% attributed the problem to the high cost of software and the lack of useful software (18.2%). Almost one-fifth of the respondents (17.2%) indicated that unclear or incorrect instructions prevented effective use. Regarding desired changes to improve computer use, 51.8% of the owners wanted less expensive software, clearer instruction manuals (34.6%), easier methods of inputting data (22%), and computer systems that are easier to learn to operate (22%) (Table 10). Almost one-fifth (18%) of the those surveyed responded to an open ended question concerning their desires for additional education, information, or training to improve computer use. The most common requests were for more help from manufacturers and dealers by providing answers to questions and offering assistance with specific problems. Other suggestions included clear, plain instruction manuals, step by step instructions for data input, and compatible software packages. (For more information concerning problems associated with computer use see Table 31, Appendix A).

Table 9

Factors Which Prevent Computer Use of Respondents in the Home Computer Survey

N=192

Factors Preventing Use	Number	Percent
Nothing	76	39.6%
High cost of software	54	28.1
Other	48	25.0
Lack of useful software	35	18.2
Poor documentation	33	17.2
Too difficult to learn operation	24	12.5
Too much effort to input data	22	11.5
Unavailable training or education	16	8.3
Incompatible hardware and software	14	7.3
Unreliable software	10	5.2
Hardware breakdowns	4	2.1

Table 10

Desired Computer System Changes of Respondents in the Home Computer Survey

N=192

Desired Changes	Number	Percent
Less expensive software	99	51.8%
Clearer instruction manuals	66	34.6
Easier methods of inputting data	42	22.0
Systems that are easier to learn to operate	42	22.0
More useful software available	38	19.9
Compatible software and hardware	30	15.7
More readily available training and education	30	15.7
Correct instruction manuals	29	15.2
None	26	13.6
Other	24	12.5
More reliable software	15	7.9
More reliable hardware	5	2.6

Computer Ownership Related Items

This section discusses the results from several items related to computer ownership including: frequency of showing the computer to visitors in the home, number of other home computer owners known by the respondents, information sources used before purchase to evaluate various computer brands, and respondents experience with other products and services which use computer technology.

The results indicated that the respondents had some contact with others concerning the computer. More than half (56%) reported they "sometimes" showed their computer to visitors in their home, while 29% "often" or "always" showed their computer to visitors (Table 32, Appendix A). Almost half (48.5%) of those who responded knew five or fewer other computer owners and 30.9% knew six to fifteen other owners (Table 33, Appendix A).

The most common information sources used before purchase were computer magazines (67.3%), computer stores (58.8%), other computer owners (55.8%), and the work place (39.7%) (Table 11). Respondents were also asked to rank the top three information sources which had most influenced their evaluation of different computers. Almost one-fourth (23.6%) ranked other computer owners as the most influential, while 19.9%

Table 11

Information Sources Respondents in the Home
Computer Survey Used Before the Computer Pur-
chase

N=198

Information Sources	Number	Percent
Computer magazine	134	67.3%
Computer store	117	58.8
Other owners	111	55.8
At the work place	79	39.7
Computer magazine advertising	66	33.2
Computer use class	41	20.6
Work associate (non-owner)	36	18.1
Friend (non-owner)	33	16.6
Television advertising	31	15.6
Newspaper	30	15.1
Popular magazine	30	15.1
Popular magazine advertising	22	11.1
Other	17	8.6
Television show	16	8.0
Relative (non-owner)	14	7.0
User groups	10	5.0

ranked computer magazines first. Almost one-fourth (23.7%) ranked computer magazines as second most influential and 16.8% ranked other computer owners second. Those sources ranked third in influence were: user groups, 19.6%; other owners, 18.3%; and television shows, 11.8%. Further evaluation of the results indicated that more than half (54.3%) of the respondents used one interpersonal information source and 62.3% used one media source.

Rogers (1983) has found that an innovation which is more compatible with potential adopters past experience is more likely to be adopted than one which is less compatible. Based on these findings a list of twenty products and services was compiled from similar lists used in other studies (Dickerson and Gentry, 1983 and Rogers, 1982). Each of the items on the list used some type of computerized technology. The respondents were asked to indicate, from the list, which products and services they had used before.

Almost ninety percent (89.9%) of the respondents indicated they used credit cards and 88.4% had used a digital clock or watch (Table 12). More than half (63.8%) had an entertainment channel for their television (e.g.-HBO), while a similar group (60.3%) had a microwave oven, and 59.8% had used an automated teller machine.

Table 12

Top Ten Products and Services Owned by Respondents in the Home Computer Survey

N=199

Products and Services	Number	Percent
Credit cards	179	89.9%
Digital clock or watch	176	88.4
Entertainment channel (HBO)	127	63.8
Microwave oven	120	60.3
Automatic teller	119	59.8
Video games	100	50.3
Programmable calculator	81	40.7
Sony Walkman	75	37.7
Food processor	72	36.2
Video tape recorder	66	33.2

Table 13

Level of Hardware Satisfaction of Respondents
in the Home Computer Survey

N=199

Satisfaction	Number	Percent
Very satisfied	108	54.3%
Moderately satisfied	68	34.2
Moderately dissatisfied	15	7.5
Very dissatisfied	8	4.0
Total	199	100.0%

Table 14

Level of Software Satisfaction of Respondents
in the Home Computer Survey

N=198

Satisfaction	Number	Percent
Very satisfied	59	29.8%
Moderately satisfied	95	48.0
Moderately dissatisfied	31	15.7
Very dissatisfied	13	6.6
*Total	198	100.1%

*Totals may not equal 100% due to rounding.

Table 15

Level of Overall Satisfaction of Respondents
in the Home Computer Survey

N=199

Satisfaction	Number	Percent
Very satisfied	89	44.7%
Moderately satisfied	82	41.2
Moderately dissatisfied	19	9.5
Very dissatisfied	9	4.5
*Total	199	99.9%

*Totals may not equal 100% due to rounding.

The final variable addressed under ownership related items concerned respondents satisfaction with several aspects of their computer's performance. More than half (54.3%) were "very satisfied" with the computer hardware, 34.2% were "moderately satisfied", and 11.5% were dissatisfied (Table 13). Almost one-third (29.8%) were "very satisfied" with the computer's software, 48% were "moderately satisfied", and 22.3% were dissatisfied (Table 14). Respondents also indicated their satisfaction with the overall operation of the computer system. The results indicated that 47.7% were "very satisfied" overall, 41.2% were "moderately satisfied", and 14% were dissatisfied (Table 15).

Tests of Hypotheses

This section discusses the findings of the six null hypotheses of the study.

Hypothesis 1

There is no difference in owners level of satisfaction with hardware, software, and their overall satisfaction, and the number of interpersonal and media information sources used.

This hypothesis was tested using oneway analysis of variance with the level of significance set at .05. The "moderately dissatisfied" and "very dissatisfied" categories were collapsed into one dissatisfied category for statistical analy-

sis. Six tests were completed for each satisfaction variable and each information source. None were found to be significant, therefore the null hypothesis was retained.

Hypothesis 2

There is no difference in owners level of satisfaction with hardware, software, and their overall satisfaction, and the number of technical products and services used.

This hypothesis was tested using oneway analysis of variance. The level of significance was set at .05. The "moderately dissatisfied" and "very dissatisfied" categories were collapsed into one dissatisfied category for statistical analysis. Three tests were completed for each satisfaction variable and the number of products and services used. One was found to be significant.

The results indicated that there was a significant difference in the level of hardware satisfaction and the number of products and services used (Table 16). An F-value of 3.84, with three degrees of freedom, was significant beyond the .05 level ($p=.01$). The results of the Tukey multiple comparison test revealed that those respondents who used one to four technical products and services and those who used seven to ten products and services had significantly different means of hardware satisfaction than those who used 11 to 20. The Tukey test indicated those who used the most products and services (11 to 20) had the lowest mean for hardware satis-

faction and those who used the smallest number of products and services had the highest mean for hardware satisfaction.

The results of the first test indicated a significant difference existed between the number of products and services used, and the level of hardware satisfaction. Thus, this was rejected. The results of the second and third tests revealed there were no significant differences between the level of software and overall satisfaction and the number of products and services used. Therefore, these were retained.

Hypothesis 3

There is no difference in owners level of overall satisfaction and the amount spent on hardware.

This hypothesis was tested using oneway analysis of variance. The level of significance was set at .05. The "moderately dissatisfied" and "very dissatisfied" categories were collapsed into one dissatisfied category for statistical analysis.

The results indicated there was a significant difference in the level of overall satisfaction and the amount spent on hardware (Table 17). An F ratio of 6.05, with three degrees of freedom, was significant beyond the .05 level ($p=.0006$). The results from the Tukey multiple comparison test revealed

Table 16

Oneway Analysis of Variance for the Level of Satisfaction with Hardware and the Number of Products and Services Used by Respondents in the Home Computer Survey

Source	SS	df	MS	F-ratio	F-prob.
Between	7.00	3	2.33	3.84	.0106*
Within	117.83	194	.61		
Total	124.83	197			

* (p < .05)

Tukey Multiple Comparison Test

<u>Mean</u>	<u>Group</u>	<u>Group 1</u> 1-4 Products and services used	<u>Group 2</u> 5-6 Products and services used	<u>Group 3</u> 7-10 products and services used	<u>Group 4</u> 11-20 products and services used
1.2692	4				
1.4600	2				
1.7263	3				*
1.8519	1				*

* (p < .05)

the respondents who spent less than \$800 on software had significantly different means for overall satisfaction than those who spent between \$801 and \$2000, those who spent between \$2001 and \$4000, and than those who spent more than \$4000. These results implied there was an inverse relationship between the amount spent on hardware and the mean for overall satisfaction. Those who spent the least amount on hardware had the highest mean for overall satisfaction and those who spent the most on hardware had the lowest mean for overall satisfaction.

As discussed above, the results indicated a significant difference existed between the average amount spent on hardware and overall satisfaction. Therefore, the null hypothesis was rejected.

Hypothesis 4

There is no difference in owners level of overall satisfaction and the amount spent on software.

This hypothesis was tested using oneway analysis of variance. The level of significance was set at .05. The "moderately dissatisfied" and "very dissatisfied" categories were collapsed into one dissatisfied category for statistical analysis.

Table 17

Oneway Analysis of Variance for the Level of Overall Satisfaction and the Amount Spent on Hardware of Respondents in the Home Computer Survey

Source	SS	df	MS	F-ratio	F-prob.
Between	8.24	3	2.75	6.05	.0006*
Within	85.42	188	.45		
Total	93.67	191			

* (p < .05)

Tukey Multiple Comparison Test

<u>Mean</u>	<u>Group</u>	<u>Group 1</u> \$0-800 spent on hardware	<u>Group 2</u> \$801-\$2000 spent on hardware	<u>Group 3</u> \$2001-\$4000 spent on hardware	<u>Group 4</u> More than \$4000 spent on hardware
1.4167	4				
1.5862	3				
1.6400	2				
2.0000	1		*	*	*

* (p < .05)

The results indicated there was a significant difference in the level of overall satisfaction and the amount spent on software (Table 18). An F-ratio of 3.88, with two degrees of freedom, was significant beyond the .05 level ($p=.02$). The results of the Tukey multiple comparison test revealed those who spent \$150 or less on software had a significantly different mean for overall satisfaction than those who spent more than \$400 on software. Further inspection of the data indicated that those who spent \$150 or less on software had the highest mean for overall satisfaction.

As discussed above, the results indicated there was a significant difference between the amount spent on software and owners level of overall satisfaction. Therefore, the null hypothesis was rejected.

Hypothesis 5

There is no difference in owners level of overall satisfaction and the amount of random access memory (RAM).

This hypothesis was tested using oneway analysis of variance. The level of significance was set at .05. The "moderately dissatisfied" and "very dissatisfied" categories were collapsed into one dissatisfied category for statistical analysis.

Table 18

Oneway Analysis of Variance for the Level of Overall Satisfaction and the Amount Spent on Software of Respondents in the Home Computer Survey

Source	SS	df	MS	F-ratio	F-prob.
Between	3.56	2	1.78	3.88	.0227*
Within	74.87	163	.46		
Total	78.43	165			

* (p < .05)

Tukey Multiple Comparison Test

<u>Mean</u>	<u>Group</u>	<u>Group 1</u> 0-\$150 spent on software	<u>Group 2</u> \$151-\$400 on software	<u>Group 3</u> More than \$400 spent on software
1.5652	2			
1.5714	3			
1.8772	1			*

* (p < .05)

The results indicated there was a significant difference in the level overall satisfaction and the amount of RAM (Table 19). An F-value of 7.03, with two degrees of freedom, was significant beyond the .05 level ($p=.001$). The results from the Tukey multiple comparison test revealed those who had 48k of RAM or less had a significantly different mean for overall satisfaction than those who had 49k to 64k, and those who had more than 64k of RAM. These results implied there was an inverse relationship between the mean for overall satisfaction and the amount of RAM. Those who had the least RAM had the highest mean for overall satisfaction and those who had the highest amount of RAM had the lowest mean for overall satisfaction.

As discussed above, the results indicated there was a difference between the amount of RAM and overall satisfaction. Therefore the null hypothesis was rejected. (For a summary of the oneway analysis of variance tests see Table 20).

Hypothesis 6

There is no difference in income levels for home computer owners and the Richmond, Virginia population.

Table 19

Oneway Analysis of Variance for Level of Overall Satisfaction and the Amount of Random Access Memory (RAM) of the Respondents in the Home Computer Survey

Source	SS	df	MS	F-ratio	F-prob.
Between	6.65	2	3.33	7.03	.0011*
Within	88.40	187	.47		
Total	95.05	189			

* (p < .05)

Tukey Multiple Comparison Test

<u>Mean</u>	<u>Group</u>	<u>Group 1</u> 0-48K of RAM	<u>Group 2</u> 49-64K of RAM	<u>Group 3</u> Over 64K of RAM
1.5082	3			
1.6386	2			
2.0000	1		*	*

* (p < .05)

A two-tailed T-test was used to determine if there was a difference in income levels for the owners surveyed and the average for the total Richmond population.

The data indicated there was a significant difference in income levels for computer owners and the Richmond population. A T-value of 14.73, with 189 degrees of freedom, was significant beyond the .05 level ($p < .05$). Therefore, the null hypothesis was rejected.

Discussion of Objectives

Objective 1

To demographically describe selected home computer owners in Richmond, Virginia in terms of sex, age, education, occupation, income, marital status, presence of children under 18 in the household, and presence of employed adults in the household.

The results of the survey indicated that the typical home computer owner was male, 40 years old or younger, had some college education or completed college, had a professional occupation, and had an annual household income between \$25,000 and \$55,000.

These results were consistent with those of other studies which investigated home computer ownership. Dickerson and

Table 20
 Oneway Analysis of Variance Summary for Hypotheses
 One through Five

Dep. Variable	Indep. Variable	df	F ratio	prob
<u>Hypothesis 1</u>				
a. Hardware satisfaction	Interpersonal information sources	2	1.28	.2817
b. Hardware satisfaction	Media information sources	2	.91	.4030
c. Software satisfaction	Interpersonal information sources	2	.03	.9733
d. Software satisfaction	Media information sources	2	.11	.8933
e. Overall satisfaction	Interpersonal information sources	2	1.29	.2780
f. Overall satisfaction	Media information sources	2	.61	.5470
<u>Hypothesis 2</u>				
a. Hardware satisfaction	Products and services used	3	3.84	.0106*
b. Software satisfaction	Products and services used	3	1.1	.1160
c. Overall satisfaction	Products and services used	3	2.34	.0751
<u>Hypothesis 3</u>				
a. Overall satisfaction	Amount spent on hardware	3	6.05	.0006*
<u>Hypothesis 4</u>				
a. Overall satisfaction	Amount spent on software	2	3.88	.0227*
<u>Hypothesis 5</u>				
a. Overall satisfaction	Amount of RAM	2	7.03	.0011*

* (p < .05)

Gentry (1983) reported that adopters of home computers were 45 years old or younger, were highly educated, and had incomes of \$40,000 or less. Rogers (1982) found that home computer owners were male, about 36 years old and highly educated, with incomes of almost \$40,000. In a similar study, Venkatesh and Vitalari (1983a) indicated that home computer owners were again, male, about 38 years old, had a college degree, and had incomes of \$30,000 or more. Link Resources (New Media, 1984) reported that the head of the home computing household was 38, had a college degree, was in a professional or managerial work position, and had an annual household income between \$30,000 and 35,000.

These results were also consistent with Rogers (1983) suggestion that adopters with higher incomes are better able to accept the financial burden associated with the purchase of a home computer.

Objective 2

To identify how home computers were being used in the home.

The survey respondents reported using the computer for personal word processing, entertainment and games, work related word processing, and learning programming.

These results were consistent with those of other studies concerning computer adoption and use. Venkatesh and Vitalari (1983a) reported the most common actual uses were word processing, business applications, and entertainment. Rogers (1982) found that entertainment, personal word processing, and work related word processing were the most common applications. In a nationwide study of home computer owners Link Resources (New Media, 1984) found that home computers were most commonly used for games, programming, filing and storing information, and education. In a similar study by "Consumer Reports" magazine (How our readers, 1983), the results indicated the four most common uses were learning about computers, learning programming, and word processing.

Objective 3

To determine how many hours per week each home computer application was used by individual household members.

The results indicated that respondents tended to use each of the seven listed applications one to two hours per week or a total of one to ten hours per week for all the applications. The listed applications included: entertainment, learning aid, personal and work related word processing, personal and work related accounting and data base access. The second household member used the computer about one to two hours per week for entertainment, as a learning aid, and for personal

word processing or a total of five to ten hours per week. The majority of this group were male and under 17 years of age.

Rogers (1983) reported that the respondents in a home computer owner survey used the computer about 17 hours per week. Results from Link Resources (New Media, 1984) indicated that home computer owners used their computer two hours or more per day. The results of the present study indicated the owners tended to use the computer less than the respondents in Roger's study and less than those in the New Media survey.

Objective 4

To determine whether owners expectations about how the home computer would be used changed between the purchase and the time of the study.

The results indicated that of those who responded, almost three-fourths said their expectations had not changed since the purchase. These responses were consistent with the answers to two previous questions which indicated there was little change between the respondents expected use at purchase and actual computer use.

Research by Katona (1960) indicated that expectations change over time through the acquisition of information or personal experience. Using the measures employed in this study, it

appeared that these results were inconsistent with Katona's findings. The results were also opposite the findings reported by Venkatesh and Vitalari (1983a). In their study, the results indicated a large difference between the respondents intended use prior to purchase and their actual use.

Objective 5

To ascertain what factors home computer owners believed prevented them using their computer as they expected.

Objective 6

To ascertain what changes home computer owners believed were needed to help them fulfill their expectations.

Objective 7

To ascertain what information, education, or training home computer owners believed were needed to help them fulfill their expectations.

The results indicated that a large portion of those surveyed said there were no factors which prevented them from using their computer as they had expected. Of those who reported their computer use had been hampered, the problem was attributed to several factors including the high cost of software, the lack of useful software, and unclear or incorrect instructions. Regarding desired changes to improve computer use, more than half of the owners wanted less expensive software and others wanted clearer instruction manuals, easier methods of inputting data, and computer systems that

were easier to learn to operate. Almost one-fifth of the those surveyed responded to an open ended question concerning their desires for additional education, information, or training to improve computer use. The most common requests were for more help from manufacturers and dealers by providing answers to questions and offering assistance with specific problems. Other suggestions included clear, plain instruction manuals, step by step instructions for data input, and compatible software packages.

The results of the present study indicated home computer owners had similar problems to those reported by Rogers (1982) and Venkatesh and Vitalari (1983a). Roger's (1982) research indicated that some home computer owners encountered several severe problems using their computer system. The problem most often cited was lack of adequate instructions followed by system breakdowns, lack of useful programs, and difficulty learning to use the system. These results were somewhat similar to those of the present study in that disappointment with instructions and difficulty learning to use the system were found in both studies. Lack of useful software was also mentioned in the present study as a factor which had prevented effective computer use. Venkatesh and Vitalari (1983a) reported that the majority of home computer owners were not satisfied with the compatibility of different

manufacturers hardware and software components and many were dissatisfied with the computer's instructions.

Objective 8

To determine what information sources were used by home computer owners before the purchase to evaluate various computer brands.

The respondents reported the most common information sources used before purchase (during the persuasion stage) were computer magazines, computer stores, other computer owners, and the work place. Further evaluation of the results indicated that more than half of the respondents used one interpersonal information source and one media source.

As stated above, the majority of the respondents indicated that they obtained prepurchase information from a computer magazine, which is a media information source. According to Rogers (1983), at the persuasion stage of the adoption process, (when an individual actively looks for more information) interpersonal communication channels are more effective than media channels. At first glance these results appeared to be inconsistent with Rogers theory, but further inspection of the data revealed that this was not the case. The results indicated that, even though more than half of the respondents obtained information from a computer magazine, during the persuasion stage, the majority also ranked other

computer owners as the information source that most influenced their evaluation of various computer brands.

The cost of information may reveal, in part, why respondents did not use more sources. Maynes (1976) contended that as time becomes more scarce it becomes more valuable. Consequently, many consumers will forego the information search because the time cost of the search is too high. In a related discussion, Linder (1970) and Mencer (1963) argued that as consumer's incomes increase and time becomes more valuable, consumers will spend less time in decision making or find a way to search for information which requires less time. Sproles (1983) suggested that shopping and searching for information is not exciting for many consumers, so they may become bored or distracted during the search. Maynes has also pointed out that some degree of technical knowledge is often needed to purchase complex products and many consumers lack this knowledge or lack the ability to understand it. Each of these influences may have resulted in fewer sources being consulted.

Objective 9

To determine home computer owners satisfaction with computer hardware, software, and the overall operation of the computer system.

The results indicated more than half of those surveyed were "very satisfied" with the computer hardware, while over one-third were "moderately satisfied", and about ten percent were dissatisfied. Almost one-third were "very satisfied" with the computer's software, and almost half were "moderately satisfied", while over one-fifth were dissatisfied. Respondents also indicated their satisfaction with the overall operation of the computer system. The results indicated that about half were "very satisfied" overall, while over forty percent were "moderately satisfied", and almost fifteen percent were dissatisfied.

Venkatesh and Vitalari (1983a) reported that the majority of respondents were satisfied with hardware reliability and software reliability, while more than half were not satisfied with the compatibility of different manufacturers hardware and software components. Almost one-fourth of those surveyed were not satisfied with the documentation or instructions for general systems. The results of the present study appeared to be consistent with those of Venkatesh and Vitalari. In both studies, most of the respondents were satisfied with both hardware and software components. However, using the measures employed here, the respondents in the present study appeared to more satisfied than those surveyed by Venkatesh and Vitalari.

Discussion of Hypotheses

Hypothesis 1

There is no difference in owners level of satisfaction with hardware, software, and their overall satisfaction, and the average number of interpersonal and media information sources used.

Of the six tests using oneway analysis of variance none were found to be significant.

This hypothesis was based on an argument advanced by Day (1976) which asserted that consumers expectations about the performance of a product may affect the level of satisfaction. Based on this it was assumed in this study, that consumers who used several information sources knew what kind of performance to expect from a product. Therefore, consumers who used more information sources would be expected to be more satisfied than those who used fewer.

The results of this study implied that this was an incorrect assumption. The use of information sources had no effect on the level of satisfaction.

Hypothesis 2

There is no difference in owners level of satisfaction with hardware, software, and their overall satisfaction, and the number of technical products and services used.

Of the three tests using oneway analysis of variance, only one was found to be significant. The results indicated there was a significant relationship between the number of products and services used and owners level of satisfaction with hardware. The results from the Tukey multiple comparison test revealed those who used the highest number of products and services had the lowest mean for hardware satisfaction and those who reported using the smallest number of products and services had the highest mean for hardware satisfaction.

Rogers (1983) has reported that an innovation which is more compatible with potential adopters past experiences is more likely to be adopted than one that is less compatible. It was assumed, therefore, that those respondents who own other products and services had higher levels of satisfaction because computers were more compatible with their past experiences.

The results of this study indicated the opposite may be true: those with higher levels of hardware satisfaction used a smaller number of services.

Hypothesis 3

There is no difference in owners level of overall satisfaction and the amount spent on hardware.

Hypothesis 4

There is no difference in owners level of overall satisfaction and the amount spent on software.

The results of the oneway analysis of variance indicated there were significant relationships between the average amount spent on hardware and overall satisfaction and also between the amount spent on software and overall satisfaction. The results of the Tukey multiple comparison test revealed that those who reported higher levels of overall satisfaction also indicated spending lower amounts on hardware and software.

Engel and Blackwell (1982) suggested that one result of consumer satisfaction is repeat purchase. By extension, Venkatesh and Vitalari (1983a) hypothesized that a relationship might exist between levels of satisfaction and expenditures on computer hardware. Their results indicated there was a relationship between additional expenditures on hardware and satisfaction with hardware reliability, instruction manuals, maintenance of the system, programming time, and the standardization of manufacturers products.

The results of the present study were not consistent with Venkatesh and Vitalari (1983a).

Hypothesis 5

There is no difference in owners level of overall satisfaction and the amount of random access memory (RAM).

The results of a oneway analysis of variance indicated there was a relationship between the amount of RAM and overall satisfaction. The results of the Tukey multiple comparison test revealed that there was an inverse relationship between the amount of RAM and the mean for overall satisfaction. Those who had the lowest amount of RAM had the highest mean for overall satisfaction and those with the highest amount of RAM had the lowest mean for overall satisfaction.

Sharpe (1969) suggested that the size of computer memory may be associated with computer effectiveness. Based on this, Venkatesh and Vitalari (1983a) hypothesized that greater effectiveness would lead to greater satisfaction. Their research indicated there was a positive relationship between memory size and the level of satisfaction with hardware reliability, satisfaction with software reliability, and satisfaction with the time needed for data entry. The results of this study were not consistent with Venkatesh and Vitalari's findings.

Hypothesis 6

There is no difference in income levels for home computer owners and the Richmond, Virginia population.

The results of a two tailed T-test indicated there was a significant difference in income levels between the computer owners surveyed and the Richmond population.

The results were consistent with other studies investigating home computer ownership which have consistently shown that owners had higher incomes than the general population (Rogers, 1982; Venkatesh and Vitalari, 1983a) These findings have been attributed to two factors by Rogers (1983). First, home computer owners are not likely to be typical of the general population because they have been innovators and early adopters. Second, home computer owners may tend to have higher incomes because they have the resources to finance the investment.

CHAPTER V- SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary of the Problem and Procedures

The purpose of the study was to identify how home computers were used by owners and their households, and to identify problems that owners have experienced using home computers. In addition, the study attempted to determine what changes or information home computer owners believed were needed to use their computer more effectively.

Surveys were mailed to 774 computer magazine subscribers living in Richmond, Virginia. The names and addresses of these owners were selected from a subscription list for "Personal Computing" magazine. All respondents had owned their computer at least six months and were at least 18 years old. A 45-item mail questionnaire was designed for use in the study. The questionnaire included five sections: questions concerning computer ownership, questions concerning computer use and problems with use, questions concerning household members hourly computer use, computer related factors, and demographics.

Questionnaires, cover letters, and stamped return envelopes, addressed to the researcher, were mailed to "Personal Com-

puting" subscribers. A reminder postcard was mailed out one week later.

Of the 774 questionnaires mailed, 397 (51%) were returned. Of these, 149 were not home computer owners and therefore ineligible to participate in the survey. Eight additional questionnaires were invalid and not used in the study.

The remaining 240 questionnaires were returned by home computer owners. Forty of these were not usable because the respondents did not meet the minimum ownership requirement (six months), the respondent did not meet the minimum age requirement (18 years), or the questionnaire contained a high number of unanswered questions.

Descriptive statistics were used to describe each questionnaire item. Five hypotheses were tested using oneway analysis of variance and one was tested using a two tailed T-test.

Conclusions

Objective 1

To demographically describe selected home computer owners in Richmond, Virginia in terms of sex, age, education, occupation, income, marital status, presence of children in the household, and presence of employed adults in the household.

The typical respondent was described as male, 40 years old or younger, with some college education or a college degree. They were in professional occupations, and had an annual household income between \$25,000 and \$55,000.

These results were consistent with those from several other home computer owner studies (Dickerson and Gentry, 1983; New Media, 1984; Rogers, 1982; and Venkatesh and Vitalari 1983a) which reported that the respondents tended to be male, about 40 years old, well educated, and had high incomes.

The purchase of a home computer is a large investment for most households. The respondents reported spending, on average, over \$2,000 on hardware and over \$600 on software. These relatively high expenditures may explain why computer owners tended to have high incomes. As suggested by Rogers (1983) adopters with high incomes are better able to accept the financial risk associated with the purchase of a home computer. Often, income and education tend to covary. Under the conditions of this study, respondents with higher education were more likely to own a home computer. The owners with higher educations may have had occupations which required or encouraged the use of home computers, therefore they tended to use home computers more than those with less education.

It was implied from the results that the group of home computer owners who responded were among the earlier adopters. Rogers (1983) characterized earlier adopters, in part, as having higher educations and incomes than later adopters. The demographic results gathered from this study were similar to those of Rogers (1982) findings, on factors such as income, education, and occupation, which suggested that the computer owners he sampled were among the earlier adopters.

Objective 2

To identify how home computers were being used in the home.

The results indicated that the respondents used the computer for personal word processing, entertainment, work related word processing, and to learn programming.

These results were consistent with those of other studies concerning home computer ownership (How our readers, 1983; New Media, 1984; Rogers, 1982; and Venkatesh and Vitalari, 1983a). Word processing or entertainment or both were among the two most common uses in each of these studies.

One explanation for above results could be related to the needs of the home computer owners. Many owners may have simply found more need for entertainment and word processing applications than for the less frequently used accounting and

programming applications. As another possibility, perhaps the software for the less frequently used applications was inadequate or not available at all. Support for this explanation was found in the results that almost one-fifth of the owners indicated that the lack of useful software had prevented them from using their computer.

In addition to those mentioned above, two other reasons have been suggested for the high frequency of computer use for word processing (Venkatesh and Vitalari, 1983a). First, this application may have required a low level skill and second, the results were highly visible. A similar explanation could be offered for the high frequency of use for entertainment and games. These applications may have also required low level skill and, as with word processing, were possibly perceived by the respondents as less complex than other applications.

These explanations were consistent with a theory proposed by Rogers (1983). According to Rogers, innovations which are perceived as being less complex tend to be adopted faster than those which are perceived to be more complex. The same principle could be applied to home computer applications. The respondents may have perceived entertainment and word processing as less complex than other applications and therefore, tended to use them more frequently.

Objective 3

To determine how many hours per week each home computer application was used by individual household members.

The results indicated that the respondents and a second household member used the computer one to two hours a week for each application listed on the questionnaire (entertainment, learning aid, personal and work related word processing, personal and work related accounting, and data base access). Further inspection of the data revealed that home computer owners used the computer a total of one to ten hours per week. The second household member who used the computer tended to be male and 17 years old or younger. This group used the computer a total of five to ten hours a week. The remaining household members used the computer very little.

Rogers (1982) reported that the respondents he surveyed used the computer about 17 hours a week. Link Resources (New Media, 1984) found their respondents used the computer two hours or more a day. The results of the present study indicated that the respondents in this study tended to use the computer less than those in previous studies.

These results were supported by owners responses to a question concerning the main computer user. Respondents were asked to indicate which household member was considered the

primary computer user at the time of purchase. The majority of the owners indicated they were the main computer user. This may imply, that only one person had a primary need to use the computer in many households, which may explain why other household members used the computer so little.

Objective 4

To determine whether home computer owners expectations concerning computer use changed between the purchase and the time of the study.

The majority of the respondents indicated their expectations concerning home computer use had not changed since the purchase.

Based on the literature, this result was not predicted. Katona (1960) has indicated that expectations change over time due to the acquisition of information and personal experience. Venkatesh and Vitalari (1983a) reported large differences in home computer owners intended use prior to purchase and their actual use. The results of the present study indicated little change between respondents expected use at purchase and actual use. One possible explanation for this result is based on a concept advanced by Hirshman (1980). Hirschman concluded that without previous computer experience it would be unlikely that an adopter could foresee the variety of applications for which a computer could be

used. Over three-fourths of the respondents reported they had experience using a computer before the purchase. From these findings it could be argued that the owners expectations were realistic because they were aware of the computer's capabilities based on their past experience. Therefore, their expectations were less likely to change.

It is also possible that these respondents had not owned the computer long enough to permit a change in expectations. The average length of ownership was 17 months.

Objective 5

To ascertain what factors home computer owners believed prevented them from using their computer as they expected.

Objective 6

To ascertain what changes home computer owners believed were needed to help them fulfill their expectations.

Objective 7

To ascertain what information, education, or training home computer owners believed were needed to help them fulfill their expectations.

The results indicated that a large portion of the respondents said there were no factors which had prevented them from using the computer as they had expected. Those remaining cited several factors which had prevented use including the high cost of software, and unclear or incorrect instructions. More than half of the owners believed less expensive software

would improve their computer use, as would clearer instruction manuals and easier methods of inputting data. Almost one-fifth of the owners responded to an open ended question concerning their desires for additional education, information, or training to improve computer use. The most common requests were for more help from manufacturers and dealers by providing answers to questions and offering assistance with specific problems.

The results of other studies have indicated that home computer owners had similar complaints to those mentioned above. Rogers (1982) reported that the most common problems included inadequate instructions, system breakdowns, lack of useful programs, and difficulty learning to use the system. Venkatesh and Vitalari (1983a) found that the majority of home computer owners were not satisfied with the compatibility of manufacturers hardware and software components and the computer's instructions.

Even though a large portion of the respondents indicated there were no factors which had restricted their computer use, only about 14% reported that no changes could be made to improve their computer use. This implies that home computer owners were able to use the computer as they expected, but they may not have been using it as effectively as they could. Further evidence of this explanation was provided by

the owners requests for more help from manufacturers and dealers to answer questions and to help with problems, and their requests for clearer instructions for data input and compatible software packages.

Objective 8

To determine what information sources were used by home computer owners before the purchase to evaluate various computer brands.

The results indicated that six of the top eight information sources used by the respondents were interpersonal sources. In addition, those who were surveyed ranked other computer owners, an interpersonal source, as the information source which most influenced their evaluation of various computer brands.

One explanation for the predominant use of interpersonal sources is that potential adopters may trust friends, work associates, and other owners more than magazines, advertising, television shows, etc. In addition, the owners may have found that due to the complex nature of computers interpersonal sources could explain more clearly the information they needed to evaluate computer brands. These explanations were supported by Rogers's (1983) theory which suggested that interpersonal information sources are more effective at the persuasion stage of the adoption process (when an individual

actively seeks information) especially if it links two or more people who are peers.

Objective 9

To determine home computer owners level of satisfaction with computer hardware, software, and overall operation of the computer system.

The results of the study indicated that the majority of the respondents were "very satisfied" or "moderately satisfied" with the computer's hardware, software, and overall performance.

Hirschman (1980) concluded that without previous computer experience it is unlikely that the adopter could foresee the variety of applications for which a home computer could be used. Venkatesh and Vitalari (1983a) found that those respondents who had previous experience were more satisfied with various computer related factors, such as hardware and software reliability, than those without previous experience. Over three-fourths of the respondents in the present study indicated they had used a computer before they purchased one. Therefore, according to the findings of Hirschman (1980) and Venkatesh and Vitalari (1983a), previous computer experience may have been a factor in determining the respondents level of satisfaction.

Almost three-fourths of the respondents indicated their expectations concerning computer use had not changed since the purchase. These results may provide a second explanation for the owners high satisfaction levels. Through their previous computer experience the owners may have known what kind of performance to expect from the computer. Therefore, when these expectations were met, they were satisfied with the computer's performance.

Tests of Hypotheses

Hypothesis one stated there was no difference in owners level of satisfaction with hardware, software, and their overall satisfaction, and the number of interpersonal and media sources used. The results of the oneway analysis of variance indicated that no significant relationships existed between these variables. Day (1976) asserted that consumers expectations about the performance of a product may affect the level of satisfaction. Based on this argument, it was assumed in this study, that consumers who used several information sources knew what kind of performance to expect from their computer. Therefore, they were expected to be more satisfied than those who used fewer sources.

It was implied from the results that this was an incorrect assumption. The use of interpersonal or media information

sources had no effect on levels of satisfaction. This may be explained by the high level of prior computer experience of the respondents. Over three-fourths of the owners indicated they had used a computer before theirs was purchased. Perhaps after deciding to purchase a home computer the respondents spent only a short period of time looking for information because they gathered the information they needed during their previous experience. Therefore, additional information search was not needed and may not have impacted on satisfaction.

A second explanation concerns the owners expectations. As discussed above, Day (1976) argued that expectations about a product may affect satisfaction. Perhaps their previous experience, rather than using other information sources, provided the owners with the information needed to form realistic expectations regarding computer use. Consequently, any additional search for information had little effect on satisfaction.

Hypothesis two stated that there was no difference in owners level of satisfaction with hardware, software, and their overall satisfaction, and the number of products and services used. The results of the oneway analysis of variance tests indicated the only significant difference which existed was between the number of products and services used and the

owners satisfaction with hardware. The results of a Tukey multiple comparison test revealed that those who used a smaller number of products and services had a higher mean for hardware satisfaction and those who used a larger number of products and services had a lower mean for hardware satisfaction. These results implied that those who used a smaller number of products and services had higher levels of satisfaction than those who used a larger number of products and services.

This hypothesis was based on Roger's (1983) theory which suggested that an innovation which is more compatible with a potential adopters past experience is more likely to be adopted than one which is less compatible. It was assumed, therefore, that those adopters who used more products and services would have higher levels of satisfaction, than those who used fewer, because the computer was more compatible with their past experiences. The results discussed above indicated the opposite may be true: those with higher levels of hardware satisfaction used a smaller number of products and services than those with lower levels of satisfaction.

It is possible that those who used fewer products and services had lower expectations as to what the computer could do because they were not aware of the capabilities that computerized technology holds. Therefore, their expectations

were easily met and this resulted in satisfaction. This is supported by results which indicated that the majority of the respondents used the computer for applications which may have been perceived to be less complex, such as word processing and entertainment and the products and services used were those that have been well diffused, such as credit cards and microwave ovens. Conversely, the products and services which owners used less frequently were technically innovative services such as the computer prepared income tax service and solar panels.

Hypothesis three stated that there was no difference in owners level of overall satisfaction and the amount spent on hardware. Hypothesis four stated that there was no difference in owners level of overall satisfaction and the amount spent on software. The results of the oneway analysis of variance indicated that each of the above differences were significant. The results of the Tukey tests revealed that those who reported spending more on hardware and software had lower means for overall satisfaction than those who spent less on hardware and software. These results implied that those who spent more on hardware and software tended to be less satisfied than those who spent less on hardware and software.

Venkatesh and Vitalari (1983a) reported a positive relationship existed between additional expenditures on hardware and satisfaction. They suggested that these additional expenditures were indicators of consumer satisfaction because one result of satisfaction is repeat purchase (Engel and Blackwell, 1982). Based on Venkatesh and Vitalari's results it was assumed that higher amounts spent on hardware and software would lead to higher satisfaction. The results of this study indicated the opposite: higher expenditures on hardware and software resulted in lower levels of satisfaction.

Research by Day (1976) provided one explanation for the relationship between hardware and software expenditures and the level of overall satisfaction. Day asserted that higher prices tend to create high expectations for product performance and lower prices often lead to lower expectations. By extension, this could be interpreted to mean that higher amounts spent on hardware and software led to higher expectations of computer performance and lower expenditures resulted in lower expectations. Therefore, based on this interpretation, those who spent less on hardware and software may have had lower expectations of computer performance. Lower expectations were more likely to be met, so the end result was satisfaction.

Examination of results of frequencies may provide another insight to the relationships noted above. Almost three-fourths of the respondents indicated their expectations concerning home computer use had not changed since the purchase. Over three-fourths of the owners reported they used a computer before they purchased one. Perhaps, through previous experience, the respondents knew what kind of performance to expect from a computer. If this were true, the owners knew what to expect and what they wanted concerning computer hardware and software. Consequently, there was no need for large expenditures on either. The components they purchased met their expectations, resulting in satisfaction.

Hypothesis five stated that there was no difference in owners level of overall satisfaction and the amount of random access memory (RAM). The results of the oneway analysis of variance indicated the difference was significant. The results of the Tukey multiple comparison test revealed that those who had higher amounts of RAM had a lower mean for overall satisfaction and those who had lower amounts of RAM had a higher mean for overall satisfaction. These results implied that those who had higher amounts of RAM were less satisfied overall than those with lower amounts of RAM.

Venkatesh and Vitalari (1983a) hypothesized that larger computer memory led to more effective performance and then to

higher satisfaction. Their results indicated a positive relationship between memory size and satisfaction. The results of the present study indicated that smaller memory size resulted in higher satisfaction.

The relationship between RAM and overall satisfaction was in the same direction as the relationship between hardware expenditures and overall satisfaction. This covariance provided some insight as to why these relationships existed. Lower expenditures on hardware may have led to the purchase of less memory, or the decision to have a lower amount of RAM may have resulted in lower hardware expenditures. However, a conclusion in one direction or another was not possible based on the results from this study.

As discussed earlier, higher expenditures tend to lead to higher expectations which are often more difficult to meet than lower expectations. This assumption provided an explanation for the relationship between RAM and overall satisfaction. Those respondents who had lower amounts of RAM, like those who spent less on hardware, may have had lower expectations regarding the computer's performance. These expectations may have been more easily met than higher expectations, and therefore the respondents were satisfied with the performance of the computer.

Hypothesis six stated that there was no difference between income levels for the home computer owners surveyed and the Richmond, Virginia population. The results of a two-tailed T-test indicated there was a significant difference between those surveyed and the Richmond population.

It was implied from the results that home computer owners tended to have higher incomes than the general population. As suggested by Rogers (1983), this is probably because the purchase of a home computer can require a large investment. Those with higher incomes were better able to accept the risk involved with the investment.

Recommendations

The following recommendations were based on the results of the study and the literature.

1. The results of the study indicated that the typical home computer owner in Richmond, Virginia was male, well educated, in professionala occupation, and had a relatively high income. The computer was used most often for personal word processing, entertainment, and work related word processing. As the prices of home computers decline, continuing research could be conducted to monitor changes in the demographic characteristics, usage pat-

terns, previous computer experience, and satisfaction levels of the typical home computer owner. In conducting such research evidence could be gathered to see if there is a difference in the diffusion patterns between earlier adopters and later adopters of this technology. Studies of computer user group members would be an ideal focus to investigate how computer users network and how usage patterns vary over time.

2. The results indicated that owners expectations did not change after the purchase and the majority had prior experience using a computer. Further research could be undertaken to determine if expectations change if the owners did not have previous experience and as the length of ownership increases.

3. The results of this study indicated computer owners were less than satisfied with the high cost of software, the lack of useful software, incompatible software, and the existence of unclear and incorrect instructions. Further research could be conducted to determine what types of software consumers believe are priced too high in an attempt to reduce these costs to a more acceptable level for consumers. Manufacturers and dealers could continue marketing research to determine what types of software consumers want and need. Additional research could be

done to explore more fully specific complaints home computer owners have concerning computer instruction manuals. This research could provide a beginning for the improvement of instruction manuals. Manufacturers and dealers could provide computer users with software packages that are compatible between systems.

The results also indicated that for most home computer owners, interpersonal sources were the most commonly used and the most effective in providing information. Therefore, expanding the availability of these sources may result in more effective computer use and higher satisfaction. The respondents provided some insight as to what types of information could be provided.

Many home computer owners reported they needed more help from manufacturers and dealers to provide assistance with specific problems and to answer questions. Levitt (1983) suggested that to ensure consumer satisfaction after the purchase, sellers must continue to interact with their customers, which includes keeping up with their complaints and future needs. To accomplish this, manufacturers could provide toll free telephone numbers for customers with problems, questions, complaints, or requests. Toll free telephone lines would be one way of

providing consumers with effective interpersonal information.

Computer dealers and their sales personnel could provide another type of interpersonal information source. This group, by being well informed and familiar with the computer systems and hardware and software components they sell, could provide qualified assistance to customers with questions about buying, using, or expanding a computer system. The use of such interpersonal information sources would be consistent with Rogers (1982) theory which suggested that the diffusion of home computers is primarily through interpersonal information sources. Further, interpersonal information sources may be more effective than media sources because these sources may provide information which is clearer and easier to understand. This is especially true of home computers due to the complexity of this innovation.

A third alternative open to dealers would be to offer short courses for customers to provide them with "hands on" computer experience. These courses could include material for beginners learning how to use the computer as well as for advanced customers working with more complex applications. The suggestion for availability of "hands on" experience is based on the results of previous

research (Venkatesh and Vitalari, 1983a) which indicated that previous computer experience was positively related to satisfaction.

4. As discussed earlier, the results indicated that home computer owners most commonly used interpersonal information sources in their prepurchase information search and that these were more influential than media information sources. These findings were consistent with Rogers (1983) research which indicated that during the persuasion stage (during the prepurchase information search) interpersonal information sources were more important than media sources. In addition, the owners reported that less expensive software, clearer instruction manuals, systems that were easier to learn to operate, and more useful software were some of the changes they needed to use their computer effectively.

Based on these results, an extension program, using primarily interpersonal information sources, could be developed to provide home computer owners and potential owners with these changes and other information so they could use their computer more effectively.

The suggestion for the use of interpersonal information sources was based on two related theories, discussed

earlier, which have been advanced by Rogers (1983,1982). The first suggested interpersonal sources were more important at the persuasion stage of the adoption process. Many consumers may come to extension agents during the persuasion stage (when they are actively seeking information), a time when the use of interpersonal information sources would be most beneficial. The second theory asserted that the diffusion of home computers is primarily through interpersonal information sources. Therefore, evidence existed which indicated that those who come to extension agents for information after the persuasion stage may still benefit from the use of interpersonal information sources. A major reason interpersonal sources may be so effective is due to the complex nature of computers. Interpersonal sources may provide information which is clearer and easier to understand.

The extension program could entail four aspects. The first could include pamphlets or booklets containing information on a variety of computer related topics. Some of these might concern what factors should be considered when buying a home computer. Other written information could concern specific suggestions for using various hardware and software components including what types of components are available and how they might be used. Other material could include information regarding spe-

cific problems owners may encounter using a computer such as the ones mentioned by the respondents in the present study.

The written material could be used in conjunction with the second aspect which would involve personal consultations with the extension agent both in person at the office and over the telephone. The use of written material with consultations would be primarily for efficiency and convenience. By combining the two aspects, extension agents could avoid spending long periods of time explaining information that could be read more quickly and easily. The availability of consultations would allow the agent to clarify or expand the information the client obtained earlier or to answer specific questions the client may have.

A third aspect could include the provision of "hands on" experience through work shops covering a variety of topics from beginning computer use to instructions for specific applications. The importance such experience has been demonstrated by previous research (Venkatesh and Vitalari, 1983a) which indicated that prior computer experience impacted positively on satisfaction. As the agent works with individual clients in the first two stages, they may be able to get some idea if a group work

shop is needed to deal with some common requests or problems.

The final aspect, home visits, could provide assistance for those clients who need help with a specific problem or application for which there is not a great demand that would require a group work shop. Again, the suggestion of home visits was based on Roger's theories which revealed the importance of interpersonal information sources. A program which integrated each of the four aspects described above could provide home computer owners with much needed information and assistance to effectively use their computer.

5. The results indicated that adult males and males age 17 and under were the most frequent household computer users. Further research could be undertaken to explore why other household members, especially females, do not use the computer. Additional research could be conducted to find methods to encourage other members, especially females, to use the computer.
6. Certain areas of research, that may impact on consumer satisfaction, concern past research which has investigated the effect of the computer on the household (Goss and Byrd, 1985; Venkatesh, Vitalari, and Gronbaugh, 1983).

This research could be expanded to explore more fully how the computer affects family living and communications including modes of work, interpersonal relationships, residential arrangements and relationships to groups outside the prior known shopping, business, and support systems.

APPENDIX A. ADDITIONAL FREQUENCY TABLES

Table 1

Marital Status of Respondents in the Home Com-
puter Survey

N=200

Marital Status	Number	Percent
Never Married	37	18.5%
Married	134	67.0
Divorced	23	11.5
Separated	3	1.5
Widowed	3	1.5
Total	200	100.0%

Table 2

Presence of Children Under 18 in the Households
of Respondents in the Home Computer Survey

N=198

Children Under 18 Present	Number	Percent
Yes	86	43.4%
No	112	56.6
Total	198	100.0%

Table 3

Number of Children Under 18 of Respondents in
the Home Computer Survey

N=87

Number of Children Under 18	Number	Percent
1	40	46.0%
2	34	39.1
3	10	11.5
4	3	3.4
Total	87	100.0%

Table 4

Presence of Employed Adults in the Households
of the Respondents in the Home Computer Survey

N=196

Number of Employed Adults	Number	Percent
0	10	5.1%
1	87	44.4
2	87	44.4
3	6	3.1
4	6	3.1
*Total	196	100.1%

*Totals may not equal 100% due to rounding.

Table 5

Computer Brands Owned by Respondents in the
Home Computer Survey

N=199

Brand	Number	Percent
Commodore 64	28	14.1%
Other	28	14.1
IBM PC	27	13.6
Apple IIe	24	12.1
TI/99 4A	18	9.0
Apple II+	15	7.5
Commodore Vic 20	9	4.5
TRS80 Color Computer2	6	3.0
Franklin Ace 100	6	3.0
Osborne I	5	2.5
TRS80 Color Computer	5	2.5
TRS80 Model III	5	2.5
Atari 800	4	2.0
Kaypro II	3	1.5
Apple MacIntosh	3	1.5
Timex/Sinclair 1000	3	1.5
Atari 600XL	2	1.0
Coleco Adam	2	1.0
Compaq Portable	2	1.0
Osborne Executive	1	.5
TRS80 Model 100	1	.5
Atari 1200XL	1	.5
Atari 400	1	.5
*Total	199	99.9%

*Totals may not equal 100% due to rounding.

Table 6

Reason Cited for Computer Brand Purchase Choice
of Respondents in the Home Computer Survey

N=200

Reason for Brand Purchase	Number	Percent
Cost	133	66.5%
Availability of software	108	54.0
Size and reputation of manufacturer	87	43.5
Ability to expand with peripherals	78	39.0
Programmability (languages, power)	63	31.5
Other	29	14.5
Ability to interface with other systems	25	12.5
Ability to link with friends and associates	23	11.5
Recommended by friend(s)	20	10.0

Table 7

Length of Computer Ownership of Respondents in
the Home Computer Survey

N=196

Months of Ownership	Number	Percent
6-12	92	46.9%
13-24	70	35.7
25-36	22	11.2
37 or more	12	6.1
*Total	196	99.9%

Mean=17 months

*Totals may not equal 100% due to rounding.

Table 8

Primary Computer User in Households in the Home
Computer Survey

N=198

Primary Computer User	Number	Percent
Myself	158	79.8%
Children	15	7.6
Other	15	7.6
No one in particular	8	4.0
Spouse	2	1.0

Table 9

Number of Computers Owned by Households in the Home Computer Survey

N=196

Number of Computers Owned	Number	Percent
1	148	75.5%
2	36	18.4
3	11	5.6
4	1	.5
Total	196	100.0%

Table 10

Amount of Random Access Memory of Respondents
in the Home Computer Survey

N=190

Random Access Memory	Number	Percent
16k or less	25	13.2%
17k-32k	8	4.2
33k-48k	13	6.8
49k-64k	83	43.7
65k-80k	1	.5
81k-192k	31	16.3
Over 192K	29	15.3
Total	190	100.0%

Mean=110k

Table 11

Peripherals Purchased with the Computer by
 Respondents in the Home Computer Survey

N=164

Peripherals	Number	Percent
Floppy disk	106	64.6%
Monitor	96	58.5
Printer	75	45.7
Joy sticks and game paddles	38	23.2
Cassette recorder	37	22.6
Modem	14	8.5
Mouse	5	3.0
Other	5	3.0

Table 12

Peripherals Purchased After the Computer Purchase by Respondents in the Home Computer Survey

N=198

Peripherals	Number	Percent
Printer	141	71.2%
Floppy disk	136	68.7
Monitor	126	63.6
Joy sticks and game paddles	80	40.4
Cassette recorder	76	38.4
Modem	60	30.3
Other	28	14.1
Mouse	7	3.5

Table 13

Actual Computer Use Now of Respondents in the
Home Computer Survey

N=190

Computer Use	Number	Percent
Personal word processing	111	58.4%
Entertainment	99	52.1
Work related word processing	95	50.0
Learning programming	90	47.4
Home budgeting/accounting	82	43.2
Learning aid	81	42.6
Work related accounting	56	29.5
Data base access	47	24.7
Other	23	12.1
Write programs to sell	19	10.0

Table 14

Expected Computer Use at Purchase of Respondents in the Home Computer Survey

N=200

Computer Use	Number	Percent
Learning programming	126	63%
Entertainment	125	62.5
Personal word processing	121	60.5
Learning aid	119	59.5
Home budgeting/accounting	113	56.5
Learning about computers	110	55.0
Work related word processing	95	47.5
Data base access	65	32.5
Work related accounting	60	30.0
Writing programs to sell	24	12.0
Other	17	8.5

Table 15

Computer Use in First Six Weeks to Two Months
of Ownership by Respondents in the Home Com-
puter Survey

N=198

Computer Use	Number	Percent
Entertainment	117	59.1%
Learn about computers	100	50.5%
Learning programming	87	43.9
Personal word processing	71	35.9
Learning aid	66	33.3
Work word processing	61	30.8
Home budgeting/accounting	48	24.2
Work related accounting	39	19.7
Other	17	8.6
Data base access	14	7.1
Write programs to sell	9	4.5

Table 16

Expected Computer Use Now of Respondents in
the Home Computer Survey Whose Expectations
had Changed Since the Purchase

N=55

Computer Use	Number	Percent
Personal word processing	32	58.2
Learning aid	29	52.7
Learning programming	28	50.9
Entertainment	27	49.1
Home budgeting/accounting	26	47.3
Data base access	24	43.6
Work related word processing	21	38.2
Learning about computers	16	29.1
Work related accounting	12	21.8
Other	11	20.0

Table 17

Hours Per Week Home Computer Survey Respondents Spent Using their Computer for Games

N=75

Hours	Number	Percent
1	44	58.7%
2	14	18.7
3	3	4.0
4	6	10.6
More than 4 hours	8	10.6
Total	75	100.0%

Mean=2.12

Table 18

Hours Per Week Home Computer Survey Respondents Spent Using their Computer as a Learning Aid

N=56

Hours	Number	Percent
1	23	41.1%
2	14	25.0
3	3	5.4
4	5	8.9
More than 4 hours	11	19.7
*Total	56	100.1

Mean=2.77

*Totals may not equal 100% due to rounding.

Table 19

Hours Per Week Second Household Member in the
Home Computer Survey Spent Using the Computer
for Personal Word Processing

N=34

Hours	Number	Percent
1	21	61.8%
2	5	14.7
3	4	11.8
More than 3 hours	4	11.8
*Total	34	100.1%

Mean=2.62

*Totals may not equal 100% due to rounding.

Table 20

Hours Per Week Home Computer Survey Respondents Spent Using their Computer for Work Related Word Processing

N=79

Hours	Number	Percent
1	19	24.1%
2	15	19.0
3	13	16.5
4	6	7.6
More than 4 hours	26	32.9
*Total	79	100.1%

Mean=5.29

*Totals may not equal 100% due to rounding.

Table 21

Hours Per Week Home Computer Survey Respondents Spent Using their Computer for Personal Accounting

N=80

Hours	Number	Percent
1	40	50.0%
2	25	31.3
3	3	3.7
4	7	8.7
More than 4 Hours	5	6.1
*Total	80	99.8%

Mean=2.39

*Totals may not equal 100% due to rounding.

Table 22

Hours Per Week Home Computer Survey Respondents Spent Using their Computer for Work Related Accounting

N=46

Hours	Number	Percent
1	13	28.3%
2	9	19.6
3	3	6.5
4	4	8.7
More than 4 hours	17	37.0
*Total	46	100.1%

Mean=5.15

*Totals may not equal 100% due to rounding.

Table 23

Hours Per Week Home Computer Survey Respondents Spent Using their Computer for Data Base Access

N=48

Hours	Number	Percent
1	8	16.7%
2	12	25.0
3	5	10.4
4	8	16.7
More than 4 hours	15	31.3
*Total	48	100.1%

Mean=5.42

*Totals may not equal 100% due to rounding.

Table 24

Total Hours Per Week Home Computer Survey Re-
spondents Used the Computer

N=164

Hours	Number	Percent
1-2		
3-4	20	12.2%
5-6	30	18.3
7-8	29	17.7
9-10	13	7.9
More than ten	19	11.6
	53	32.3
Total	164	100.0%

Table 25

Hours Per Week Second Household Member in the
Home Computer Survey Spent Using The Computer
for Games

N=55

Hours	Number	Percent
1	23	41.8%
2	10	18.2
3	3	5.5
4	4	7.3
More than 4 hours	15	27.2
Total	55	100.0%

Mean=3.49

Table 26

Hours per Week Second Household Member in the
Home Computer Survey Spent Using the Computer
as a Learning Aid

N=49

Hours	Number	Percent
1	20	40.8%
2	10	20.4
3	7	14.3
4	5	10.2
More than 4 Hours	7	14.3
Total	49	100.0%

Mean=4.10

Table 27

Hours Per Week Home Computer Survey Respondents Spent Using their Computer for Personal Word Processing

N=100

Hours	Number	Percent
1	33	33.0%
2	29	29.0
3	11	11.0
4	6	6.0
More than 4 hours	21	21.0
Total	100	100.0%

Mean=3.36

Table 28

Total Hours Per Week Second Household Member
in the Home Computer Survey Used the Computer

N=85

Hours	Number	Percent
1-4	20	23.5%
5-10	47	55.3
More than ten	18	21.2
Total	85	100.0%

Table 29

Age of Second Household Members in the Home
Computer Survey Who Used the Computer

N=88

Age	Number	Percent
17 or younger	42	47.7%
18-25	9	10.2
26-30	5	5.7
31-35	7	8.0
36-40	11	12.5
41-45	4	4.5
46-50	5	5.7
51-57	5	5.7
Total	88	100.0%

Mean=24

Table 30

Locations of Previous Computer Use of Re-
spondents in the Home Computer Survey

N=158

Locations	Number	Percent
At work	108	67.9%
In a computer class	42	41.2
At a computer store	31	19.6
At a friends house	25	15.8
Some place else	19	12.0

Table 31

Computer Applications Found Unusable by Respondents in the Home Computer Survey

N=182

Computer Applications	Number	Percent
None	85	46.7%
Data base access	48	26.4
Home budgeting/accounting	35	19.2
Personal word processing	23	12.6
Work related accounting	16	8.8
Learning programming	16	8.8
Learning more about computers	14	7.7
Work related word processing	13	7.1
Learning aid	11	6.0
Other	8	4.4

Table 32

How Often Respondents in the Home Computer
Survey Reported Showing their Computer to
Visitors

N=200

Frequency	Number	Percent
Never	30	15.0%
Sometimes	112	56.0
Often	42	21.0
Always	16	8.0
Total	200	100.0%

Table 33

Number of Other Computer Owners Home Computer
Survey Respondents Knew

N=178

Number of Other Owners	Number	Percent
0-2	49	27.5%
3-5	42	21.0
6-9	27	15.2
10-15	28	15.7
16-25	18	10.1
26-80	14	7.9
Total	178	100.0%

Mean=9

Table 34

Number of Visitors Shown the Home Computer by
Respondents in the Home Computer Survey

N=195

Number of Visitors	Number	Percent
0-1	94	48.2%
2-3	59	30.3
4-6	29	14.9
7-20	13	6.7
*Total	195	100.1%

Mean=2

*Totals may not equal 100% due to rounding.

APPENDIX B. QUESTIONNAIRE USED IN THE STUDY

HOME COMPUTER OWNERS STUDY:

WHAT ARE THEY DOING? WHAT DO THEY WANT?



Courtesy of Personal Times

*"Well, of course I love you.
But a personal computer is forever."*

Instructions: This survey is being conducted to give us a better understanding of how home computer owners are using their computers. This questionnaire should be completed by the main adult computer user (over 18) in your house. If you own more than one computer, these questions should apply only to the computer most recently purchased. Please answer all of the questions. If you wish to comment on any questions or qualify your answers, please feel free to use the space in the margins. Your comments will be read and taken into account.

Thank you for your help.

Return this questionnaire to:
Mary Carter, Principal Investigator
College of Human Resources, HDM
218 Wallace Hall
Virginia Tech
Blacksburg, VA 24061

Do you own a home computer? (circle one)

- 1 YES
- 2 NO

If yes, please go to the next page and complete the questionnaire. Then mail it to us in the return envelope.

If no, we thank you for your time but our research concerns computer owners. Please, mail the uncompleted questionnaire to us in the return envelope.

PART ONE

First we would like to ask a few questions about the kind of computer you own.

1. Please circle the number next to the brand and model of computer you own. If your computer is not on the list, write the brand and model in the spaces provided below.

- | | | | |
|----|-----------------------|----|-------------------------------------|
| 1 | APPLE II+ | 14 | KAYPRO 4 |
| 2 | APPLE IIe | 15 | APPLE MACINTOSH |
| 3 | ATARI 400 | 16 | OSBORNE I |
| 4 | ATARI 800 | 17 | OSBORNE EXECUTIVE |
| 5 | ATARI 1200XL | 18 | SINCLAIR ZX81 |
| 6 | ATARI 600 XL | 19 | TI/99 4A |
| 7 | COLECO ADAM | 20 | TRS80 COLOR COMPUTER |
| 8 | COMMODORE VIC 20 | 21 | TRS80 COLOR COMPUTER 2 |
| 9 | COMMODORE 64 | 22 | TRS80 MODEL III |
| 10 | CCMPAQ PORTABLE | 23 | TRS80 MODEL 4 |
| 11 | FRANKLIN ACE 1000 | 24 | TRS80 MODEL 100 |
| 12 | IBM PERSONAL COMPUTER | 25 | TIMEX/SINCLAIR 1000 |
| 13 | KAYPRO II | 26 | OTHER: BRAND: _____
MODEL: _____ |

2. How many home computers do you own? (including the one mentioned above) _____.
3. Why did you buy this brand? (Circle all that apply)
- 1 COST
 - 2 AVAILABILITY OF SOFTWARE
 - 3 PROGRAMMABILITY (LANGUAGES, POWER)
 - 4 ABILITY TO EXPAND WITH PERIPHERALS
 - 5 SIZE AND REPUTATION OF MANUFACTURER
 - 6 ABILITY TO INTERFACE WITH OTHER SYSTEMS
 - 7 ABILITY TO LINK WITH FRIENDS AND ASSOCIATES
 - 8 RECOMMENDED BY FRIEND(S)
 - 9 OTHER (PLEASE SPECIFY) _____
4. When the computer was purchased, who was to be the main user? (circle one)
- 1 NO ONE IN PARTICULAR
 - 2 MYSELF
 - 3 SPOUSE
 - 4 CHILDREN
 - 5 OTHER (PLEASE SPECIFY) _____

5. When did you purchase your computer?

MONTH _____ YEAR _____

6. Considering only hardware (not software, supplies, repairs or maintenance), approximately how much have you spent on your computer and peripherals up to now? \$ _____

7. Have you spent anything on software?

1 YES
2 NO

↓

If yes, how much? _____

If no, is it because software came with the computer package when purchased? 1 YES
2 NO

8. How much random access memory (RAM) does your computer system have? (e.g. 64K) _____

9. The next two questions concern the peripherals you now own and those you bought with your computer.

A. Circle the numbers in column A for each of the peripherals you now own for your computer.

B. Circle the numbers in column B for each of the peripherals which were obtained at the same time as your computer.

	A	B	
NOW OWN		PURCHASED WITH COMPUTER	
1	1	1	MODEM
2	2	2	MONITOR
3	3	3	CASSETTE RECORDER
4	4	4	PRINTER
5	5	5	FLOPPY DISK DRIVE(S)
6	6	6	JOY STICKS OR GAME PADDLES
7	7	7	MOUSE
8	8	8	OTHER (SPECIFY) _____

PART TWO

1. Next, we would like to ask some questions about how you and your family use your computer.
 - A. Please circle the numbers in column A for all the functions you and your family now use your computer for.
 - B. Please circle the numbers in column B for all the functions you and your family used your computer for during the first six weeks to two months that you owned it.

A	B	
ACTUAL USE NOW	USE IN FIRST SIX WEEKS	
1	1	ENTERTAINMENT (GAMES)
2	2	LEARNING AID
3	3	WORK RELATED WORD PROCESSING
4	4	PERSONAL WORD PROCESSING
5	5	WORK RELATED ACCOUNTING
6	6	HOME BUDGETING/ACCOUNTING
7	7	DATA BASE ACCESS (LINKING TO OTHER INFO. SYSTEMS)
8	8	LEARNING PROGRAMMING
9	9	LEARNING ABOUT COMPUTERS
10	10	WRITING PROGRAMS TO SELL
11	11	OTHER (SPECIFY) _____

Now, we would like to find out some information about how you planned to use your computer.

2. Please circle all the numbers in column A for all the functions you expected to use your computer for when you bought it.

A		
EXPECTED USE AT PURCHASE		
1	ENTERTAINMENT	6
2	LEARNING AID	7
3	WORK RELATED WORD PROCESSING	8
4	PERSONAL WORD PROCESSING	9
5	WORK RELATED ACCOUNTING	10
		11
		OTHER (SPECIFY) _____

3. Expectations often change after a purchase is made. Have your expectations about how you and your family would use your computer changed since you bought it? (circle one)

1 NO
2 YES

- B. If yes, please circle the numbers in column B for all the functions for which you now expect to use your computer.

B

EXPECTED USE NOW	
1	ENTERTAINMENT
2	LEARNING AID
3	WORK RELATED WORD PROCESSING
4	PERSONAL WORD PROCESSING
5	WORK RELATED ACCOUNTING
6	HOME BUDGETING/ACCOUNTING
7	DATA BASE ACCESS (LINKING TO OTHER INFO. SYSTEMS)
8	LEARNING PROGRAMMING
9	LEARNING ABOUT COMPUTERS
10	WRITING PROGRAMS TO SELL
11	OTHER (SPECIFY) _____

1	ENTERTAINMENT	6	HOME BUDGETING/ACCOUNTING
2	LEARNING AID	7	DATA BASE ACCESS (LINKING TO OTHER INFO. SYSTEMS)
3	WORK RELATED WORD PROCESSING	8	LEARNING PROGRAMMING
4	PERSONAL WORD PROCESSING	9	LEARNING ABOUT COMPUTERS
5	WORK RELATED ACCOUNTING	10	WRITING PROGRAMS TO SELL
		11	OTHER (SPECIFY) _____

4. What applications did you and your family want to use your computer for (either now or when you bought it) but have been unable to? (circle all that apply)

1 NONE
2 LEARNING AID
3 WORK RELATED WORD PROCESSING
4 PERSONAL WORD PROCESSING
5 WORK RELATED ACCOUNTING
6 HOME BUDGETING/ACCOUNTING
7 DATA BASE ACCESS (LINKING TO OTHER INFO. SYSTEMS)
8 LEARNING PROGRAMMING
9 LEARNING MORE ABOUT COMPUTERS
10 OTHER (SPECIFY) _____

5. Is there anything which has prevented you and your family from using your computer as you had wanted? (circle all that apply)

- 1 NOTHING
- 2 HARDWARE BREAKDOWNS
- 3 LACK OF USEFUL SOFTWARE
- 4 UNRELIABLE SOFTWARE (ERRORS, DATA LOSS)
- 5 HIGH COST OF SOFTWARE
- 6 TOO MUCH EFFORT REQUIRED TO INPUT DATA
- 7 TOO MUCH EFFORT REQUIRED TO LEARN OPERATION
- 8 INCOMPATIBLE HARDWARE AND SOFTWARE
- 9 POOR DOCUMENTATION (UNCLEAR OR INCORRECT INSTRUCTIONS)
- 10 UNAVAILABLE TRAINING OR EDUCATION PROGRAMS
- 11 OTHER (SPECIFY) _____

6. What changes do you feel would help you use your computer more effectively? (circle all that apply)

- 1 NONE
- 2 MORE RELIABLE HARDWARE (FEWER BREAKDOWNS)
- 3 USEFUL SOFTWARE AVAILABLE
- 4 MORE RELIABLE SOFTWARE (FEWER ERRORS, LESS DATA LOSS)
- 5 LESS EXPENSIVE SOFTWARE
- 6 EASIER METHODS OF INPUTTING DATA
- 7 SYSTEMS THAT ARE EASIER TO LEARN TO OPERATE
- 8 COMPATIBLE SOFTWARE AND HARDWARE
- 9 CLEARER INSTRUCTIONS/MANUALS
- 10 CORRECT INSTRUCTIONS/MANUALS
- 11 MORE READILY AVAILABLE TRAINING AND EDUCATION PROGRAMS
- 12 OTHER (SPECIFY) _____

7. What additional information, educational material, or training do you feel would help you and your family use your computer more effectively?

PART THREE

Now, we would like to ask you some questions about how you and other household members presently use your computer.

- In the table below, fill in one line for each computer user at home. First, enter whether the person is male or female, then enter the persons age and complete the line by entering the number of hours per week that person generally spends doing word processing, playing games, etc. List yourself on line A.*

USER		HOURS PER WEEK					
SEX	AGE	GAMES	LEARNING AID	WORD PROCESSING PERSONAL WORK	ACCOUNTING PERSONAL WORK	DATABASE ACCESS	
A	___	___	___	___	___	___	
B	___	___	___	___	___	___	
C	___	___	___	___	___	___	
D	___	___	___	___	___	___	
E	___	___	___	___	___	___	
F	___	___	___	___	___	___	

- If there any other applications you use that are not listed above please write them in the table below.

SEX	AGE	APPLICATION	HOURS PER WEEK
___	___	___	___
___	___	___	___
___	___	___	___

*In the table above please circle the hours per week of any application that is used for school work.

PART FOUR

In this next section we will be asking questions on several computer related factors.

1. How often do you show your computer to visitors in your home? (circle one)
 - 1 NEVER
 - 2 SOMETIMES
 - 3 OFTEN
 - 4 ALWAYS

2. How many visitors have you shown your computer to in the last month? _____

3. How many other home computer owners do you know? _____

4. Where did you get information about home computers before you bought one? (circle all that apply)

1 FRIEND (NON-OWNER)	9 COMPUTER MAGAZINE
2 RELATIVE (NON-OWNER)	10 NEWSPAPER
3 WORK ASSOCIATE (NON-OWNER)	11 POPULAR MAGAZINE
4 OTHER COMPUTER OWNERS	12 TELEVISION SHOW
5 COMPUTER STORE	13 COMPUTER MAGAZINE ADVERTISING
6 COMPUTER USE CLASS	14 POPULAR MAGAZINE ADVERTISING
7 AT YOUR WORK PLACE	15 TELEVISION ADVERTISING
8 USER GROUP(S)	16 OTHER (SPECIFY)

5. Please rank which three of the above information sources most influenced your evaluation of various computers. (write in the appropriate numbers).
 - 1 _____
 - 2 _____
 - 3 _____

6. Did you ever use a computer before you bought one? (circle one)
 - 1 NO
 - 2 YES

↓

If yes, circle where.

1 AT WORK	4 IN A COMPUTER CLASS
2 AT A FRIENDS HOUSE	5 SOMEPLACE ELSE (SPECIFY)
3 IN A COMPUTER STORE	

7. Do you own any of these products or use any of these services?
(circle all that apply)

- | | | | |
|----|------------------------------------|----|---|
| 1 | SONY WALKMAN (OR SIMILAR PRODUCT) | 11 | TELEPHONE ANSWERING SERVICE |
| 2 | FOOD PROCESSOR | 12 | CALL WAITING/CALL FORWARDING |
| 3 | PROGRAMMABLE CALCULATOR | 13 | SPEED DIALING ON THE TELEPHONE |
| 4 | VIDEO TAPE RECORDER | 14 | ALTERNATIVE LONG DISTANCE TELEPHONE SERVICE |
| 5 | DIGITAL CLOCK OR WATCH | 15 | AUTOMATIC BILL PAYING |
| 6 | VIDEO GAMES | 16 | AUTOMATIC DEPOSITS |
| 7 | MICROWAVE OVEN | 17 | AUTOMATED TELLER MACHINE |
| 8 | SOLAR PANELS | 18 | COMPUTER PREPARED INCOME TAX STATEMENTS |
| 9 | DIGITAL COMPUTER PANEL IN YOUR CAR | 19 | CREDIT CARDS |
| 10 | AUTOMATIC GARAGE DOOR OPENER | 20 | ENTERTAINMENT CHANNEL (HBO, ETC) |

Using the scale below, circle the number from one to four which best indicates your satisfaction with each of the following:

1	2	3	4
VERY SATISFIED	MODERATELY SATISFIED	MODERATELY DISSATISFIED	VERY DISSATISFIED

- 1 2 3 4 6. Considering only the hardware, how satisfied are you with your personal computer and peripherals?
- 1 2 3 4 7. Considering only the software, how satisfied are you with your personal computer?
- 1 2 3 4 8. Considering all of the factors, how satisfied are you with your personal computer?

PART FIVE

The following questions will give us some background information on home computer owners.

1. Are you male or female? (circle one)

- 1 MALE
2 FEMALE

2. What year were you born? _____
3. Do you have any children, under 18, living at home? (circle one)
- 1 NO
2 YES
- ↓
If yes, how many? _____
4. What is your current marital status? (circle one)
- 1 NEVER MARRIED
2 MARRIED
3 DIVORCED
5 SEPARATED
6 WIDOWED
5. What is the highest level of education you have completed?
(circle one)
- | | |
|--------------------------|---------------------------------------|
| 1 SOME GRADE SCHOOL | 5 SOME COLLEGE |
| 2 COMPLETED GRADE SCHOOL | 6 COMPLETED COLLEGE |
| 3 SOME HIGH SCHOOL | 7 SOME GRADUATE WORK |
| 4 COMPLETED HIGH SCHOOL | 8 GRADUATE DEGREE
(SPECIFY DEGREE) |
6. Circle the number which describes your current occupation.
- 1 PROFESSIONAL (REQUIRES BACCALAUREATE)
2 SKILLED/SEMI-PROFESSIONAL (YIELDS HIGH PAY WITH EXPERIENCE)
3 LESS SKILLED (PAY INCREASES ONLY SLIGHTLY WITH EXPERIENCE)
- 4 RETIRED
5 HOMEMAKER
6 UNEMPLOYED
7 STUDENT

KIND OF BUSINESS YOU WORK FOR _____

KIND OF WORK YOU DO _____

7. How many adults (over 18) in your household are employed? _____

8. Circle the number which describes your household income, before taxes, in 1983.

- 1 LESS THAN \$15,000
- 2 \$15,000 to \$24,999
- 3 \$25,000 to \$34,999

- 4 \$35,000 to \$44,999
- 5 \$45,000 to \$54,999
- 6 \$55,000 to \$64,999

- 7 \$65,000 to \$74,999
- 8 OVER \$75,000

In conclusion, we would like to say THANK YOU. It is only through the cooperation of yourself and others that we can carry on this research.

If you have any additional thoughts about your computer or about owning a computer, we would welcome your writing them here or on the back cover.

COMMENTS

C O M M E N T S

APPENDIX C. COVER LETTER USED IN THE STUDY



COLLEGE OF HUMAN RESOURCES

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

DEPARTMENT OF HOUSING, INTERIOR DESIGN AND RESOURCE MANAGEMENT (703) 961-6163

Your household is one of a small number in which home computer owners are being asked to provide information about how they use their computers. Persons subscribing to computer magazines in Greater Richmond are being surveyed. So that our study represents all computer owners in Richmond, it is important that each questionnaire be completed and returned. Also vital is that the questionnaire be completed by an adult (over 18) who uses the computer most frequently. If you do not own a computer, please answer the first question on the survey and return the questionnaire in the enclosed envelope. We appreciate your time but, are only surveying computer owners. We also ask that the questionnaire be returned within one week after you receive it so that we can tabulate the results as soon as possible.

In 1983, almost five million home computers were sold and 1984 sales are expected to be even higher. Even though many households own home computers, very little is known about how they are used in the home. The information you provide will enable Virginia Cooperative Extension, computer retailers, manufacturers, and other educators to develop new information that may help home computer owners to use their computers more effectively. The only way to obtain this information is to ask home computer owners like yourself.

Your answers will be kept confidential. The questionnaire has an identification number for mailing purposes only. This is so we may check your name off the mailing list when your questionnaire has been returned. Your name will never be placed on the questionnaire.

A summary of the results will be made available to all interested participants. You may receive a summary of the results by writing "copy of results requested" on the back of the return envelope, and printing your name and address below it. Please, do not place this information on the questionnaire itself. Both computer owners and nonowners may receive a summary of the results by following these steps.

I would be happy to answer any questions you might have. Please write or call. My telephone number is (703) 951-1592.

Sincerely,

Mary C. Carter
Principal Investigator

MCC/s

APPENDIX D. REMINDER POSTCARD USED IN THE STUDY

October 15, 1984

About seven days ago a questionnaire seeking information about home computer use was mailed to you. Persons subscribing to computer magazines in Richmond are being surveyed.

If you have already completed and returned the questionnaire to us, please accept our sincere thanks. If not, please do so today. Because it has been sent to only a small sample of Richmond area subscribers it is extremely important that yours also be included in the study.

If by some chance you did not receive the questionnaire, or it was misplaced, please call me right now, collect at (703) 961-5815 and I will get another one in the mail to you today.

Sincerely,

Mary C. Carter.

PS: If you don't own a home computer, please answer the first question on the survey and mail the questionnaire in the return envelope.

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