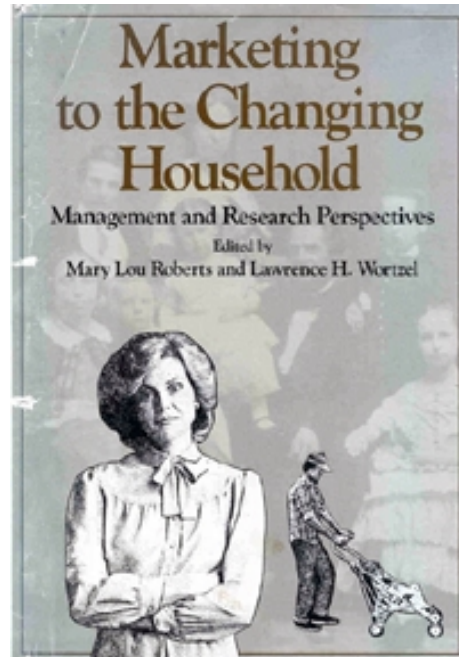


## **Households and Technology: The Case of Home Computers— Some Conceptual and Theoretical Issues**



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# HOUSEHOLDS AND TECHNOLOGY

## The Case of Home Computers-Some Conceptual and Theoretical Issues

*Alladi Venkatesh and Nicholas Vitalari*

Although the household is a major societal institution, marketing scholars and practitioners have been slow to accept it as a unit of analysis. Until recently, the major focus has been on the behavior of the single individual. Attention now seems to be shifting to both the household and the individual, presumably because of the fundamental changes occurring within the family or household setting, some of which are structural (e.g., the emergence of two-career families, single-parent families, and so on). Also contributing to this shifting emphasis is the growing interest among economists, cultural anthropologists, and family sociologists (Becker 1976; Berk and Berk 1979; Tittle 1981) who tend to regard the household as a significant social institution that plays a unique role in the consumption and production of a variety of goods and services. Much of the interest exhibited by marketers may be attributed to the recent work of Etgar (1978) and Roberts and Wortzel (1980, 1981).

In addition, changes in technology are likely to attract greater research effort on households. We have begun to hear expressions such as "the home of the future," "the electronic household," "household information services" (Tydeman 1982), which suggest that the household should be studied as a collective unit.

This paper attempts to understand the household, especially in its adoption and use of technology. It addresses two basic issues: the role of technology in the context of the household and, more specifically, the

problems and potential of home computer adoption and usage. The first part of the paper discusses how households adopt and interact with technology. The second part specifically addresses the issue of households and computer technology. Some empirical results from a recently conducted study of household adoption and use of home computers are presented to illustrate various issues developed in the conceptual part of the paper.

## **Technology and Households**

Traditionally, the interaction between technology and society has been studied in the context of a technological revolution in industry: automated factories, massive business computers, and so forth. Households eventually enter a similar technological race. The technological revolution affects daily life within a household in time allocation patterns, in the choice of social functions, in the transmittal of cultural values, and in overall human behavior (Cowan 1976; Vanek 1978; Robinson 1980). When a given technology begins to affect the life of a household, it is a safe conclusion that the technology is being integrated into the social system and is accepted as a basis for future social behavior. For example, automobiles have totally transformed American value systems, creating what is generally known as the automobile culture. Other technologies popularized in the past two or three decades have introduced structural changes and new ideologies within the household: Washing machines and dishwashers, entertainment-oriented products such as radio, television, and stereo equipment, architectural changes in the design of kitchens, bathrooms, and other units of physical space—all give new meaning to child rearing, women's roles, family interactions, shopping behavior, and value systems.

Most technologies affect individuals at two levels: in the work environment and in the home environment (Ginzberg 1965). In many cases, a technology begins with an industrial application and is transferred to the household environment with some modifications. The effect of such a technological sweep can be major. According to available sociological literature, individual socialization occurs through interactions within dominant cultural institutions such as families, school, church, and work place (Duncan, Featherman, and Duncan 1972). The typology of institutions can be expanded to operational situations that we call social contexts. These include family roles (wife, husband, child), occupational roles (scientist, teacher, laborer, etc.), cultural experiences, travel and recreational patterns, work socialization, and so on. This study examines the household system. Although evidence shows that the structure of American family has changed in recent years, its influence on individual attitudes behavior continues to be significant. Individual value systems

Moschis 1981 for an excellent development of the role of family communication in consumer learning.)

## **The Household as a System**

Households may be regarded as human systems that adopt rational, economic (production-oriented), and social strategies to achieve their goals and to respond to the external environment (Stolte-Heiskanen 1975). The same strategies may be used to adapt to changes externally imposed by the environment or internally generated within the system. In adopting these different strategies, the household behaves as a rational system, or a social system. These descriptors are not necessarily mutually exclusive but from the point of view of a reasonable analysis can be considered conceptually distinct.

As a rational system, the household accepts or rejects new technologies based on measurable benefits that the technologies can' confer on the household—for example, time and cost savings and improvement in material conditions. As an economic system, the household will be inclined to evaluate technologies in terms of their potential to produce goods and services that are appropriate to the functioning of the household. Households with better educated members can be considered to be better able to use a variety of household technologies, to organize their time more efficiently, and to minimize the routine, repetitive, and mundane aspects of life. Finally, as social systems, households adopt technologies because they may add power and prestige and improve their social status. Technologies may also develop better communications between members of the system and generate an interaction process in which each individual member plays a role.

## **Households and Social Change**

Social change, as defined by Rogers, "is the process by which alteration occurs in the structure and function of a social system" (Rogers 1969). Such a change may originate inside the system, outside the system, or a combination of both. Zaltman, Kotler, and Kaufman (1970:2) identify two kinds of change: Planned social change "originates with a declared intention of objectives: it starts with a purpose of altering the free play of those social consequences that have ensued from demographic, physiographic, and technological change. Unplanned social change is a result of natural forces

causing changes in society." Most social change phenomena are unplanned, and this is especially true of households that periodically come into contact with new technologies that originate from sources over which they have no control.

Because a household does not have control over the sources of technologies, it develops both defensive and adaptive mechanisms. Defensive mechanisms permit it to carefully evaluate technologies and determine how they affect the existing life patterns and what changes they would bring to the household's present approach to solving problems. New technologies mean new ambiguities, new complexities, new patterns of resource allocation, and new fears of the unknown. Paralleling defensive mechanisms are adaptive mechanisms, which facilitate change. Such mechanisms may include expectations about possible benefits, competitive and survival norms (e.g., computer literacy for children), and new experiences that would be entertaining and enlightening. Fears and expectations—the dangers posed by the unknown and the possibilities of better prospects—trigger social change.

### **Some Theoretical Perspectives on Technology and Technological Impact**

*The Notion of Technological Consciousness.* Technology, as defined by Ayres (1961), is the system of tool-using behavior. Technological consciousness develops through a process of socialization and cognitive development. Households receive a variety of technological cues and information and integrate a particular technology both consciously and unconsciously. To the extent that the integration is conscious, households react differently to various technologies mainly because of differing household characteristics. Both degree of socialization and level of cognitive development account for how households respond to the technological environment. Although technological consciousness may appear to be an individual construct, it can also be viewed as a household construct. The prevailing mode of thinking within a household and the systemic character of households suggest the characteristics and value systems that govern the attitudes and behaviors of individual members who comprise the household. Thus, we can speak of modern households, transition households, traditional households, and so on. Inkeles and Smith (1974) have shown that institutions mold individuals and that individuals internalize the values of the institutions and incorporate the salient features into their own behavior.

*Technological Functionalism.* Technological functionalism is premised on the idea that technology is what technology does. As mentioned earlier,

it is essentially a tool designed to meet a specific need of the user whether the user is an individual or an organized institution. Since our interest is in the behavior of households, we would like to view the household as a functioning social and economic system and a recipient of technology. The motivation of a household to adopt a particular technology can be discussed in terms of three theoretical dimensions: (1) instrumental/expressive, (2) passive/active, and (3) task-oriented/pleasure-oriented.

*Instrumental/Expressive.* The instrumental/expressive dimension is adapted from Parsons's classification of pattern variables (Parsons 1951): Technology is a tool that meets specific functional goals of the household. In order for a given technology to be employed successfully to realize instrumental goals, the user must have the knowledge of how technology can be utilized, have the ability to cope with the technological demands, and actually use it to meet specific functional needs. Instrumental goals are such objectives as need satisfaction, task performance, cost savings, and efficient use of time. For example, the telephone permits people to conduct business and establish instantaneous contact with others at great distances, allows two-way communication, and speeds up transactions. Such examples can be provided for other products, as well. The instrumental dimension of computers refers to their application in a variety of uses, such as management of home activities, word processing, family education, and maintaining various financial records. The expressive side of technology refers to the possibilities that technology creates for communicating emotions and affections and expressing family-related values through opinions and behavior. People engage in games and entertainment as a means of conveying their feelings toward others. Such activities have a high personal and psychological meaning in the context of the household. In much the same way that computers can be used for instrumental purposes, they can be used to satisfy expressive needs through entertainment, games, music, electronic mail, family contacts, and so on.

A hypothesis relevant to the expressive/ instrumental dimension is that households consider both expressive and instrumental needs in the adoption and use of technology. Typically, technologies that are rich in their ability to satisfy both expressive and instrumental needs are likely to be more important in a household.

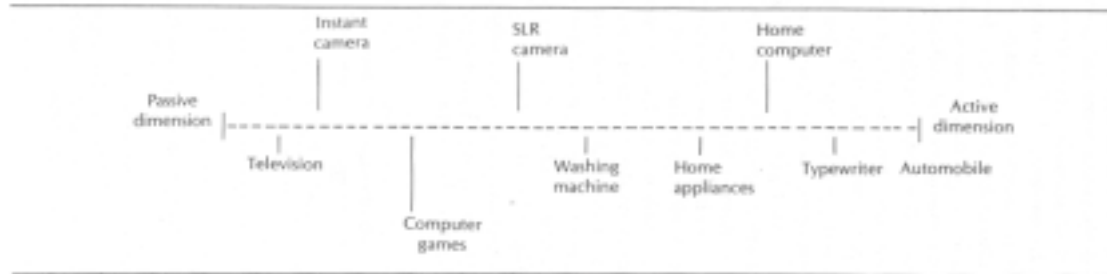
*Passive/ Active.* The passive/active dimension of technology refers to the effort required by the user to achieve the desired results from the technology. Some technologies require greater effort from the users in active, direct, mental manipulation and involvement with the technology. Associated with this requirement is training and skill level. Watching television, for example, requires very little effort, but automobile driving is as full-involvement activity. It can be hypothesized that the skill level required to adopt or use a particular technology increases on the continuum

as it moves from passive to active. Figure 11-1 shows how different technologies can be described as passive or active. Easton (1980) has argued that, other things remaining equal, passive technologies would find greater use in households. Automobiles obviously require active involvement, but the overriding need for transportation and its value as personal expression have made it a compelling technology. Home computers represent both active and passive dimensions: Computer games and computers as educational devices may attract different households because of their different passive/active dimensions.

*Task- Oriented/Pleasure-Oriented.* Although there is a relationship between the task-oriented/pleasure-oriented dimension of technologies and the passive/active dimension, they are not the same. Fried and Molnar (1975) have identified three variables that describe the task dimension: (1) serial characteristic variable, (2) operations-output relations variable, and (3) output form variable. The first variable states that sequential behavior pattern is measured on a temporal scale (i.e., turning the light switch versus wall papering). The second variable measures the degree to which operations that produce outputs are characterized by their separation. The last variable refers to the degree to which the operations are subject to routinization. Thus, the task-oriented nature of technology refers to the specific acts that the user has to perform before the technology can be put to its intended use. One example in an automobile would be starting the engine, looking through rear and side mirrors, and engaging the gear before making the automobile move. The tasks can be mechanical and routinized with minimal cognitive complexity, or they may involve some amount of training and learning. Easton (1980) argues that households adopt technologies that are not too task-oriented but instead are pleasure-oriented (television, stereo) and that they minimize the use of technologies that are high-task oriented (typewriters) unless they are high-need-oriented.

*The Nature of Technological Impact.* The idea that technology can confer both benefits and losses to the user is not new. Stover (1962) observed that whether a particular technology is beneficial or not is often an empirical question about which it is difficult to theorize. Ogburn (1964) commented that those who are affected by technology invariably have very little to say about whether a particular technology should be developed and, if developed, whether and how it should be distributed. Ogburn and Nimkoff (1955) proposed that technology has diminished the role of the household in the production sector and, consequently, its importance as a social unit. This has also led to a type of technological determinism that appears to shape the destiny of the household within a broader social context. More recently, Moses (1981) put forward the view that households act as free agents and choose the technologies that fit their specific needs. The

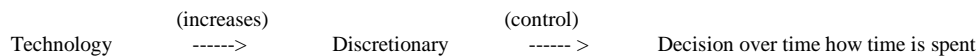
Figure 11-1. Passive and Active Dimensions of Household Technologies.



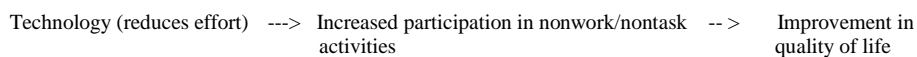
potential for such a choice and the fears and expectations surrounding it are a subject of household deliberation. Some authors have examined technology in terms of its effect on time allocation across various home-centered activities (Weiss 1969; Robinson 1977). For example, Robinson found that while the technology of the automobile makes possible a faster commute to work, the automobile also makes it possible to live further from work so that the total travel times of automobile owners and nonowners are the same. The same type of homeostatic trade-offs also appear to characterize the impact of television (Weiss 1969), which has taken time away from reading and radio listening. Several perspectives on the effects of technology have been put forward. The first view states that technology results in increased discretionary time, and makes it possible for the user to determine how the free time may be spent, which in turn permits additional control over one's life (see Figure 11-2). The second view states that technology reduces the effort required to perform task- and work-related activities and thus allows households to engage in many nontask activities. This eventually leads to an improvement in the quality of one's life (see Figure 11-3). The third view postulates that to derive benefits from technology (e.g., more efficient use of time) requires a certain level of competence or familiarity on the part of the user. Without appropriate skills and education, an individual will not find much use for a given technology. It is recognized, however, that different technologies require different levels of competence and that the level of difficulty will vary with each technology (see Figure 11-4).

A final, more comprehensive view suggests that the net benefits from a technology are not easy to capture. Given certain criteria by which to evaluate the consequent benefits of the technology, one can empirically

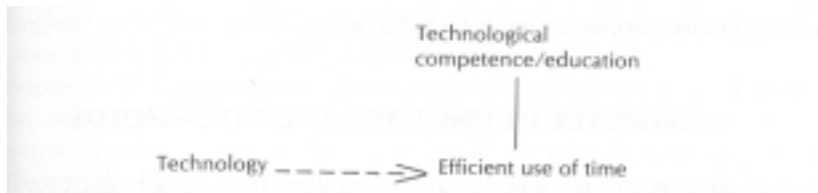
**Figure 11-2. Technology Increases Discretionary Time.**



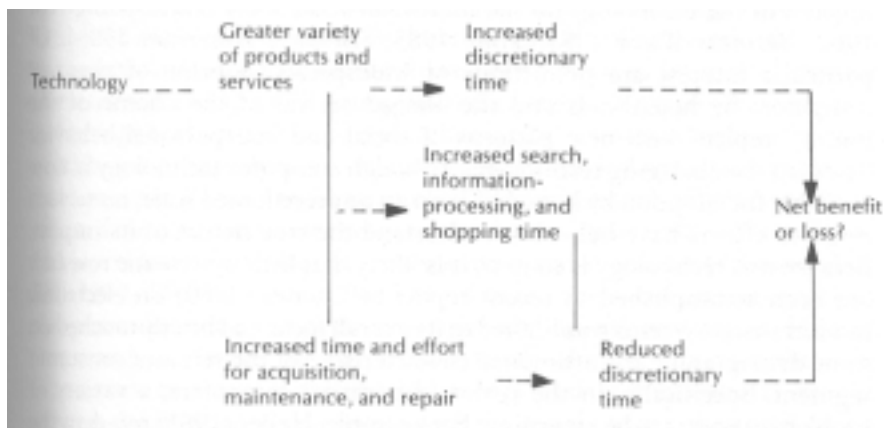
**Figure 11-3. Technology Increases Participation in Nonwork Activities.**



**Figure 11-4. Technology Requires User Competence.**



**Figure 11-5. Effects of Adopting the New Technology.**



establish whether the technology resulted in improved conditions for the user. For example, new technology usually leads to a greater variety of products and services, a possibility that in many cases increases the discretionary time of the user. Similarly, more effort is required on the part of the households that adopt the technology in terms of search time, information processing time, and shopping time. The obvious effect on discretionary time is negative. Once the products have been acquired, more time must be available for product maintenance, repair, and augmentation. Consequently, the effect of adopting the new technology cannot be stated categorically (see Figure 11-5).

Thus far, the discussion has centered on the effects of technology without reference to any particular technology. Overall benefits can be identified as improved quality of life and material conditions, increased discretionary time, and increased efficiency in task performance. Despite some negative consequences of technological adoption, the overall net effect appears to be an empirical question. In the next part of the paper, attention is focused on

the possible effects of computer technology. Computers are particularly significant because of the diversity of their use potential and the alleged revolutionary nature of their effect on users.

## **COMPUTER TECHNOLOGY AND HOUSEHOLDS**

Recent advances in microcomputer technology have greatly decreased the cost and increased the power of computers. The result is that computers are now available to a large segment of the population for personal as well as industrial use.<sup>1</sup> The application of the technology has been so dramatic and rapid that popular magazines have dedicated lead stories to the potential impacts of the technology on the individual and society (*Advertising Age* 1982; *Business Week* 1981; *Time* 1983; *Scientific American* 1983). Of particular interest are predictions of widespread adoption of personal computers by households and the alleged arrival of the "home of the future," replete with new patterns of social and interpersonal behavior based on the emerging technology. Although computer technology is now available for adoption by households on an unprecedented scale, no serious research efforts have helped to understand the true nature of its impact. Because this technology is so new, it is likely that little systematic research has been accomplished. A recent report by Humes (1980) on electronic funds transfer systems was limited in its overall focus and briefly touched on some demographic and attitudinal characteristics of the relevant consumer segment. Specifically, in the realm of personal computers, a variety of problems appears to be emerging: For example, Heller (1981) refers to the complexity of the computer systems as a barrier to consumer acceptance; Wrege (1982) has suggested several hypotheses related to cyberphobia (fear of computers) and cyberphilia (compulsive passion for computers); and C. Cohen (1982) has discussed the pressures felt by families in helping their children to become computer literate. Some other examples suggest that the ultimate acceptance of computers may depend on the task orientation of the user (Easton 1980). This study examines some of these issues.

### **The Social Impacts of Computer Technology**

It has almost been a decade since Daniel Bell (1975), in his book, *The Coming of the Post-Industrial Society*, predicted the emergence of a new social order predicated on computer information systems and access to specialized knowledge. The capabilities of this technology were expected to create new opportunities for individuals and perhaps augment different

patterns of social interaction, access to information, and allocation of time. At the same time some researchers argued that the mass adoption of this technology could lead to unanticipated, if somewhat dubious, consequences for society (Weizenbaum 1981; Kraemer and King 1977).

A considerable literature has developed in the last twenty years about the social effects of the computer in large organizations. Experience and empirical research suggest that computer technology can in certain circumstances alter task structures, roles, interpersonal relationships, and organizational structures. Broadly speaking, microcomputer technology can be evaluated in terms of its technological, economic, and social effects. Technological effects are such issues as increased power and mechanization of the task environment. Economic effects are increased productivity, labor savings, cost reduction, and other advantages or disadvantages that can be explained in economic terms. Both technological and economic impacts in the industrial and public sectors have been identified by several authors (Kraemer and King 1977; Kling 1980). Generally, adoption of information technology both in economic and technological terms has been felt to have contributed positively to the advancement of the industrial and organizations systems. Related to the technological and economic effects is the social effect of the microcomputer systems now becoming available to households and individuals. Some well-known scientists and sociologists (Simon 1977; Bell 1979; Weizenbaum 1981) have debated the social consequences of computer technology in both qualitative and quantitative terms. Missing from such a debate, however, is a reasonable assumption that the interaction between computer technology and the households can be viewed as a bi-directional process with the social impact of technology on the household occurring first, followed by changes in future technology occurring partially as a result of how households utilize it. Basic to this argument is a feedback from the household to the source of technology. A model capturing this bi-directional process will be presented in the last section of our paper after a short report on an empirical study.

### **An Empirical Investigation**

We designed an exploratory study to examine the computer usage patterns and experiences of some of the early groups of buyers of home computers. About 300 households with home computers were contacted through membership lists of computer clubs in the Orange County area of Southern California. A self-administered questionnaire was handed to the principal user within the household. Of the total questionnaires returned, 282 were found usable.

The purpose of the study was (1) to determine the specific changes in

time-allocation patterns across a variety of activities resulting from usage and application of computers in the home, (2) to identify specific ways in which computers are being used in the home and to identify general segments of usage, (3) to identify reasons and motivations for computer purchase, and (4) to determine sources of satisfaction for computer usage and to assess satisfaction levels for both. The detailed methodology and findings of the study are discussed elsewhere (Venkatesh, Vitalari, and Gronhaug 1983; Venkatesh and Vitalari 1983). Some of the highlights are presented here to illustrate the issues developed in the conceptual part.

The sample consisted primarily of males (95 percent) in professional/ managerial/ technical occupations groups with higher education and higher income status. A large majority of the users (77 percent) had previous computer experience (i.e., prior to the purchase of the home computers). Although the sample does not represent the general population, it appears to be representative of early adopters of home computers. Because a majority of respondents had used computers before, the stage for household adoption of home computers already had been set, usually at the work place. We suggested earlier that for the technological cycle to be complete the flow usually begins from work situations. The prior exposure reported by our early adopters confirms this hypothesis for computer technology. This result cannot be used to predict that all future household adoption is contingent on prior exposure in work environment. In fact, nearly 27 percent of our sample has had no such exposure. It is more likely that as home computers become more popular this sample would represent the population of interest.

Our findings also suggest there are social contexts relevant to the adoption of computer technology. For example, because 95 percent of the users are predominantly male and in families with children, it appears that the computer is creating opportunities for the father to interact with his children. While this particular social context is not evidence of "computer widowhood," it points to an important development within the household in the initial stages of computer adoption—mothers are being left out. This is likely to be less of an issue as more women become involved with computers. This issue's effect on socialization within the household needs to be investigated further.

Households also behave as rational economic systems in their use of technology. An interesting finding in our study is the significant correlation between income and initial expenditures on hardware and software. This result is intuitively appealing and supports what could be an obvious hypothesis. However, an examination of additional expenditures on computer hardware and software after initial purchase reveals that correlation with income is less significant and that expenditures increase with the level of satisfaction with computer usage. This clearly suggests that

here is a context in which the households make decisions as rational economic systems.

The level of technological consciousness within the household appears to make a difference in terms of how different households use the computers. Our results show that where the principal user has had previous experience, households have used computers for more complex applications, such as finance and home management, hobbies, and education; households without a user with previous experience have used computers more for games and word processing. Thus, the degree to which computer technology is exploited has to do with the cognitive development and cognitive competence of the household members.

An additional finding in our study refers to rankings assigned by the respondents to actual computer uses in the household and to uses they considered important. For example, the importance ranking for entertainment and games was low relative to other uses, while the ranking of actual use was rather high. The opposite was observed in the case of home and finance management. One can evaluate this result by invoking our earlier argument that households lean more toward pleasure-oriented technologies compared to task-oriented ones unless there is an overriding need for that particular use.

Another result in the study summarizes the effects of computers on home-centered activities. This research question hypothesizes that because the use of computers takes up time and because there are only a finite number of hours available per day, time is spent on computers at the expense of other activities. For the purpose of the study we identified four different types of activities: (1) activities that involve the user only (i.e., reading, hobbies, sleeping, etc.); (2) leisure time with family and friends; (3) outdoor activities; and (4) television viewing. We treated television viewing as a separate activity because of its dominant role in the American home. The respondent was asked to indicate if any increase or decrease had occurred in various activities because of and since the acquisition of the computer. Changes in these activities due to any other circumstances were not considered relevant.

Television viewing decreased dramatically, with 62 percent reporting decreases. Some computer users use television screens as display monitors, but only 16 percent of respondents used television sets for this purpose. Time spent alone increased by 34 percent, and time spent with family decreased by 18 percent. There seems to be a greater tendency for the user to spend time away from family and friends. The social consequences of this behavior should be interesting: The results already show more negative than positive effects on various activities.

Finally we investigated differences between groups of households based on how long they had owned their computers. It was assumed that initially

there would be noticeable effects on home-centered activities but that once the households become familiar with computers and integrate them into their lives, the effects would be less pronounced. In order to investigate this hypothesis we performed a simple cross-tabulation analysis between length of ownership and reported changes in activities. The results were not significant, which intuitively appeared questionable. Because the sample included a large proportion of computer users who had previous experience (77 percent), it was decided to separate the sample into two groups—those with previous experience and those without. The results showed some dramatic differences. For example, during the first year of ownership, television watching decreased for 100 percent of the no-previous-experience group but only 67 percent of the experienced group. This differential was found in other categories, such as leisure time with family (40 percent and 11 percent, respectively), leisure time with friends (30 percent and 13 percent, respectively), and so on. Clearly then, the length of ownership begins to emerge as an important variable when previous experience is held constant. As more households adopt computers, they are more likely to resemble the no-previous-experience group of the sample and more likely to feel the effects of usage. In general, the findings demonstrate that adoption of home computers by households results in changes in time allocation across different activities.

### **A Causal Model of Technological impacts on Households**

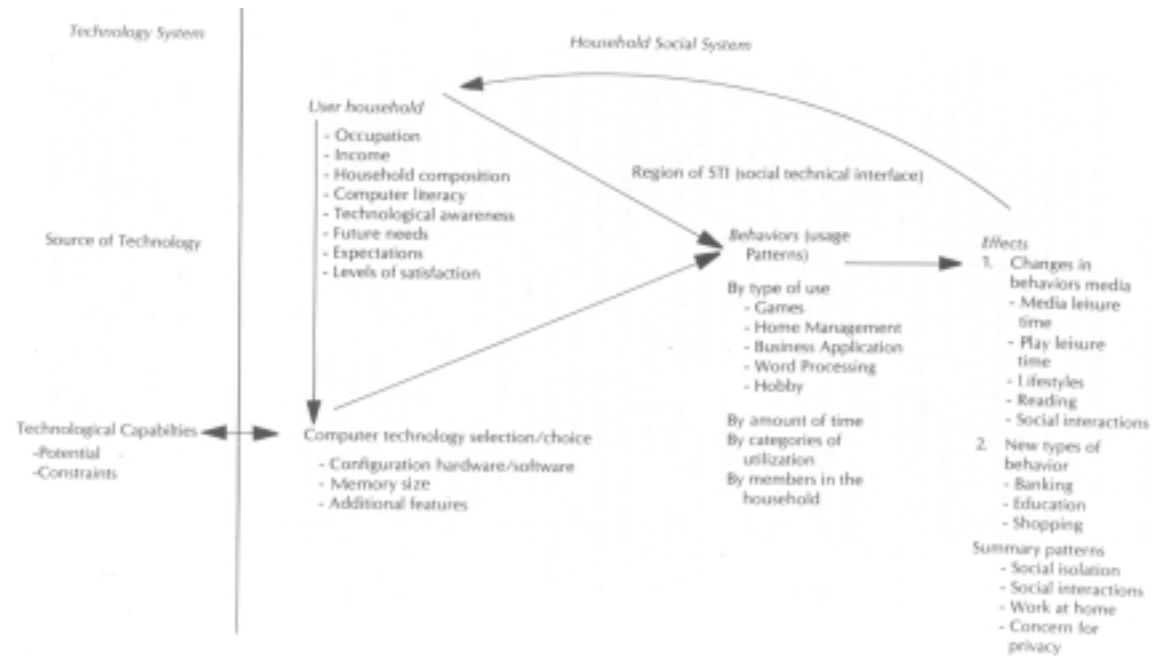
Based on our study, we developed a causal model of technological impact (Figure 11-6). Fundamental to this model are two research questions:

1. Does the personal computer affect the structure and value systems of households over time? Do any of these effects persist—that is, do they produce new patterns and values that to some extent can be accounted for by the emerging technology? If so, what are the long-term implications?
2. How do household computer usage patterns influence the configuration of hardware and software of the personal computer as it evolves over time?

Both questions are important, although the main focus of our analysis is the first question with implications for the second.

Figure 11-6 is a conceptualization of interaction between the household social system and the technology system. The household system is comprised of four major components: user household, selection and choice of computer

Figure 11-6. A Causal Model of Technological Effects on Households.





technology, a set of behaviors, and a set of effects. Similarly, the two components in the technology system are comprised of the source of technology and technological availability and capabilities. Together, these six components determine the nature of interaction between the two systems. The exact relationships between and within the two systems are identified through a causal mechanism that links the different components of the system by directional arrows. Using the concept of sociotechnical interface (STI) from social systems and organizational literature (Hedberg and Mumford 1975; Danzinger 1979), we show that a set of household behaviors toward computer technology results from the interaction between the user household's characteristics and the selection of appropriate computer technology (i.e., hardware and software). The model also shows that the choice decision itself is influenced by the characteristics of the household subject to the availability and the capabilities of the existing technology, which are in turn determined by its source. The household behaviors are operationally described as usage patterns and are further decomposed by types of use, amount of time, members of the household, and categories of utilization. While behaviors are technology specific, the effects refer to changes in household activities and to lifestyles that result from the continued use of the technology. Thus, the effects are classified in terms of changes in behavior, new types of behavior, and some summary patterns of social effect. Embedded in the model is also feedback from the effects to the characteristics of the household, implying changes may occur in some of the characteristics of the household, such as computer literacy, technological awareness, and levels of satisfaction. Family income and size and the occupation head of the household are less likely to be affected. As a result of the changes occurring in some of the characteristics of the household (e.g., level of satisfaction with the computer system), the user household may now decide to alter its future selection of computer hardware and software. Emerging patterns of uses and experiences with the technology will force computer firms to respond to the needs of the household appropriately. In terms of our model, household choice processes and use patterns eventually will affect potential technological capabilities.

## **CONCLUSIONS**

This paper has attempted to conceptualize issues in household adoption and use of technologies, with particular reference to home computers. It discussed some theoretical notions about the technology and household interface and presented a partial report on an empirical study.

The arena of households and computer technology falls into the general definition of what Kling (1980) calls the social analysis of computing. In his

comprehensive survey article, Kling (1980:62) made some observations that are pertinent to this study.

In coming to an understanding of computing technologies, particularly newer ones, it is important to understand which conceptions of social life are likely to aid in discerning critical social aspects . . . . [T]here are still not adequate theoretical accounts of computing in social life. The accounts of computing, whether developed by scholars or laymen, are strongly limited by the primitive state of social theory in general, and by the common myths that surround complex technologies in particular.

Given this compelling and provocative assessment, we believe that the effect of computing on households is a legitimate sphere of inquiry that should be seriously pursued.

#### **NOTE**

1. One recent estimate by the International Data Corp. (1983) indicates that the personal computer market will grow from \$ 3.8 billion in 1982 to \$14.2 billion in 1986. Assuming an average purchase cost of \$5,000 for each personal computer, by 1986 close to ten million personal computers will be purchased by businesses while the other 40 percent will be purchased by households. Furthermore, the capability of the home computer is expected to expand while entry cost decreases, making the computer more useful to a broader subset of the population.