Lerer, Nava

USING PERSONAL COMPUTERS AT HOME: RELATING TO THE COMPUTER, PERCEIVED CONTROL, AND TYPES OF USERS

City University of New York PH.D. 1987

PLEASE NOTE:

In all cases this material has been filmed in the best possible way from the available copy. Problems encountered with this document have been identified here with a check mark __✓__.

1. Glossy photographs or pages _____
2. Colored illustrations, paper or print _____
3. Photographs with dark background _____
4. Illustrations are poor copy _____
5. Pages with black marks, not original copy _____
6. Print shows through as there is text on both sides of page _____
7. Indistinct, broken or small print on several pages _____
8. Print exceeds margin requirements _____
9. Tightly bound copy with print lost in spine _____
10. Computer printout pages with indistinct print _____
11. Page(s) _____ lacking when material received, and not available from school or author.
12. Page(s) _____ seem to be missing in numbering only as text follows.
13. Two pages numbered _____. Text follows.
14. Curling and wrinkled pages _____
15. Dissertation contains pages with print at a slant, filmed as received ✓
16. Other _____

_____

_____

University
Microfilms
International

USING PERSONAL COMPUTERS AT HOME: RELATING TO THE COMPUTER, PERCEIVED CONTROL, AND TYPES OF USERS

by

NAVA LERER

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

1987

This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

21 APR 87
Date

Chair of Examining Committee

April 21, 1987
Date

Executive Officer

Charles Kadushin

Mary Parlee

David Rindskopf

The City University of New York

Abstract

USERS OF PERSONAL COMPUTERS AT HOME: COMPUTER-RELATED BEHAVIOR, RELATION TO THE COMPUTER, AND PERCEIVED CONTROL

by

Nava Lerer

Advisor: Professor Charles Kadushin

Personal computers (pc) which are affordable for individual use, are a relatively recent innovation. Three of the major issues discussed in the literature were investigated in this study: relations to the computer (feelings, images, and areas of interest), respondents' report of perceived control, and computer related behaviors. The present study focuses on individuals who use personal computers (IBM or IBM compatible) at home. They were surveyed using a questionnaire written on a computer diskette.

Feelings while working on the computer were combined into a scale ranging from positive to negative. Three central images of the computer were found by using factor analysis: "person" (partner, thinker, friend, similar to people), "limited" (limited, useless, unpredictable) and servant (only one item). Cluster analysis of computer-related behaviors and self rating of expertise produced five meaningful user types: "very involved" users who were knowledgeable about computers, use computers for most applications, many belong to user groups and use computerized bulletin boards; "experienced" users who

were also quite knowledgeable but are not as involved; "inexperienced enthusiasts" who had intermediate expertise, used computers mainly for finance, but liked spending time on the computer, and many belonged to user groups; "math and science" users with intermediate expertise, used the computer mainly for work, and were not as enthusiastic and involved as the previous three groups; "not involved" users who used their pc mostly for word-processing.

Issues of interpersonal control were not found to be related to feelings, images, or user types. Personal efficacy was generally related to positive relations to the computer. While all users were satisfied with their pc, the more experienced and enthusiastic users perceived the computer positively and personified it, and the least experienced and involved users had more negative perceptions and perceived the computer as a limited entity.

Acknowledgements

Being a graduate student, especially writing a dissertation, is a trying experience. Several people along the way made it a worthwhile and rewarding process. The one individual who influenced me most was the late Stanley Milgram. His constant intellectual search, his perceptiveness, his love for his work, and his support and encouragement had a great influence on my professional identity as a social psychologist and on my personal growth. I am thankful for the opportunity and the privilege of being his student, I only wish it lasted longer.

From the outset, the three members of my dissertation committee were a source of intellectual stimulation and personal support. First, professor Charles Kadushin who was there for me throughout these years as a mentor and a friend. His support and extensive involvement were most important for the development and completion of this dissertation. Professor David Rindskopf who is the only person from whom I could ever learn statistics, for his time (lots of it), encouragement, patience, faith in me, and wonderful sense of humor. Professor Mary Parlee, who was always there for me, for her wise guidance, and constant support. Her help in conceptualizing and

writing this dissertation was essential. Professor Rolf Meyersohn and Professor Kathleen Christensen, my outside readers, for the time and good advice they gave me from the start of this dissertation.

Special thanks to my husband Dov who patiently and lovingly endured this extended process. And my fellow students Bethamie Horowitz, Ztippora Hess, and Rosalind Eichenstein for being great companions and wonderful friends. Rosalind Eichenstein's help in editing and discussing this dissertation was invaluable.

I would like to thank the National Science Foundation (NSF) for supplying the funds (grant # SCS-8411914) which made this study possible. Kathleen Schiaffino and Susanne Tumelty who replaced me as directors of the NSF project after my son Noam was born, for a wonderful job without which I would never have been able to complete this dissertation. Many thanks for each and every one of the respondents who took the time and made the effort to answer our somewhat lengthy questionnaire.

TABLE OF CONTENT

CHAPTER I. INTRODUCTION.....1

The potential impact of computers - literature review.....5
Characteristics of the computer.....9
Issues for research.....15
Empirical research.....22
Focus on personal computers at home.....26
The present study.....28
Hypothesized relations between individuals and computers.....36

CHAPTER II. METHODOLOGY.....43

The pilot study.....43
The Present study.....44
Operationalization of the Issues.....48

CHAPTER III. RESULTS.....53

Description of the sample.....53
The control factors.....57
Factor analyses of perceptions of computers.....69
Perceptions, understanding, and control.....83
General types of computer users.....97
The five types and personality related variables..107
The five types and computer related behaviors.....118

CHAPTER IV. DISCUSSION.....128

Types of computer users.....131
Users' perceived control and the computer.....129
Personality and the computer.....141
Demographics.....155
Conclusion.....158

APPENDIX A. The pilot investigation.....166

APPENDIX B The interview outline for the pilot interviews.....174

APPENDIX C. The hard copy version of the computerized questionnaire.....177

Bibliography.....214

LIST OF TABLES

Table 1. The most important computer use.....56

Table 2. What the computer can do for you.....57

Table 3. Factor loading for all control items; 5 factors in varimax rotation.....61

Table 4. The factor loading of the selected control items; 4 factors using oblique rotations.....65

Table 5. Mean and standard deviation of men and women on the control scales.....66

Table 6. The factor loading of the barrier items; 3 factors, using oblique rotation.....70

Table 7. The factor loading of the "what the computer can do" items; 2 factors, using oblique rotation..74

Table 8. The factor loading of the images items; 4 factors, using varimax rotation.....75

Table 9. The factor loading of the images items; 3 factors, using oblique rotation.....77

Table 10. The factor loading of the feelings items; 4 factors, using oblique rotation.....78

Table 11. The factor loading of the areas of interest items; 3 factors, using oblique rotation.....81

Table 12. The correlations between the feelings, images, and understanding scales.....87

Table 13. The control scales as predictors of the feelings and images of the computer.....89

Table 14. The control scales as predictors of the understanding things about the computer.....92

Table 15. The original control scales as predictors of the feelings and images of the computer.....94

Table 16. The original control scales as predictors of the understanding things about the computer.....96

Table 17. Percent of computer expertise by self-description as "hacker".....99

Table 18. Types of computer users, 5 clusters.....105

Table 19. The five types and initial sampling sources.106

Table 20. Means and standard deviation of the five types on the control scales.....108

Table 21. Means and standard deviation of the five types on the original control scales.....109

Table 22. Means and standard deviation of the five types on the feelings and images scales.....110

Table 23. Means and standard deviation of the five types on the understanding scales.....112

Table 24. Means and standard deviation of the five types on "hacker" items.....115

Table 25. Means and standard deviation of the five types on personality related scales.....117

Table 26. Average hours PER WEEK of pc use by the user type.....118

Table 27. Proportion of use which is related to work and the user type.....119

Table 28. Using bulletin boards (BB) by the user type.....120

Table 29. Belonging to user groups by the user type...121

Table 30. Leave and try again by the user type.....122

Table 31. Gender by the users type.....121

Table 32. Age and the users types.....125

Table 34. Occupations by the user type.....126

LIST OF FIGURES

Figure 1. The types of users and identifying characteristics.....135

CHAPTER ONE

INTRODUCTION

Western society is often described as one which is changing from producing goods to providing services; one in which information is a major commodity (Simon, 1977; Bell, 1980; Nora & Minc, 1980; Pool, 1983). Computers constitute a technology which is crucial to the use of information, and to its storage, retrieval and processing. As such, computers play a very significant role in a society in which information is increasingly important and where its immense growth has created an "information overload" (Gotlieb & Borodin, 1973; Perrolle, 1983; Pool, 1983). Most information consumers and generators--businesses (big and small), government (Federal, State and local), schools, research institutes, libraries, and, most recently individuals--count on computers including microcomputers for assistance in dealing with this deluge of information.

The personal computer "revolution" started only in the mid-seventies when a significant reduction in price and size made it possible for individuals to purchase computers for use at home. Personal computers became a

fast growing industry and are now found in increasingly greater numbers in all areas of life (see Kroger 1984; Chen 1985; Elwork & Gutkin, 1985; Rosenberg, 1986). The expanding functions of computers for both business and personal purposes rapidly moved them from the hands of computer specialists and a few devoted users into mainstream culture (Elwork & Gutkin, 1985; Calhoun, 1981; Qualline, 1984; Evans 1979). In a comparison of surveys of the general population from 1963 to 1983, Rosenberg (1986) had found that through the years a larger number of people was exposed to computers, a trend which seemed to lead to more favorable attitudes to computers (although many still express concerns about privacy and government control).

The development of personal computers which can be used by individuals at home raises questions with respect to their effects on their users and on society at large. The nature and extent of the impact of this exposure to computers has yet to be investigated. Although the discussions of the effects of computers, including microcomputers, on society abound, most of them lack empirical validation. Specifically, there are very few studies of individual users of computers.

In most literature (see Turkle 1980, 1984; Caporael & Thorngate 1984; Chen & Paisley, 1985; Rosenberg 1986)

as well as in the present study, computers are regarded as a unique technological innovation. They are flexible, interactive machines, offering a large number of possible uses, and attract a variety of users for different reasons. The focus of the present study is the relation of individual home users to their computers. The way computers are used by different people as well as users' perceptions, feelings, and understanding of the machine are of special interest. The theories and assertions which appeared in the literature on the potential impact of computers are used as assumptions to be checked and tested empirically.

The present study is a part of a larger study conducted by Dr. Charles Kadushin, which was financed by the National Science Foundation (grant #SCS-8411914) to study users of personal compı ters. Questions concerning the ways in which individuals use and relate to their computers were included in the larger study whose focus was the helping processes of users of microcomputers through a conceptual framework of diffusion, exchange, homopholy, content, and context. This kind of research required the study of the networks of computers users, eliciting from an initial sample of respondents selected randomly an additional sample of computer users to whom they helped or received help from.

Another aspect which was unique to the larger study was the use of a questionnaire written on a computer diskette. It was hoped that since the sample consisted of computer users, and computers were the focus of the investigation, respondents would be more inclined to answer a disk questionnaire which used the medium itself. The use of a disk questionnaires, however, had several flows. First, it took much longer to program the questionnaire than was initially expected, especially since it was necessary to switch the programming language from Basic (which, after a pilot trial, was found to be too slow) to C. These problems with programming and reprogramming had delayed the study for more than a year. In addition, a whole group of respondents which was supposed to be included, Macintosh users, had to be dropped from the study since their questionnaire could not be timely programmed. Second, some respondents did not answer the questionnaire because they were intimidated by the necessity to use an unfamiliar program (although all they had to do was to type start). It is possible though, that some of the respondents who did answer had decided to do so because it was on a computer diskette.

The Potential Impact of Computers - Literature Review

A large proportion of the literature about computer use is either evaluative and speculative, or concentrates on the potential impact of computers on society or specific settings such as the workplace and the educational system. Almost no detailed data exist on individual users of personal computers; their computer-related behavior, their perceptions and images of their computers, and psychological issues which might involved in computer use. While literature which deals with the theoretical and conceptual issues of computer use by individuals is not large, it presents interesting observations and intriguing questions about the use of computers. The information, interpretation, and discussion it provides is a useful starting point for further empirical investigation.

Most early discussions of the impact of computers on society were general rather than focused and were based on the authors' impressions, personal experiences, and values rather than hard data. Many writers optimistically saw a transformation to an "information age" as an inevitable evolutionary social process. Improvement in the human condition was predicted as a result of the use of this technological innovation, benefits ranging from efficient decision making processes

to more free time for individuals (Bell, 1980; Simon, 1980; Toffler, 1980).

Others were less optimistic, they saw the evolution of technology in general and computers in particular as having a life of its own, independent of human needs. These theorists predicted that computer users would be forced to change their diverse and unique "human" ways of thinking into a mode that machines can understand and control. The results would be destructive by creating feelings of depersonalization, dehumanization and alienation in computer users (Mumford, 1970; Gotlieb & Borodin, 1973; George, 1977; Ellul 1964, 1980). A more balanced opinion was that the effect depended on the interaction with the user mediated by the social context (Kling, 1980; Hiltz, 1983; Paisley, 1985; Chen 1985).

It is clear, however, that since computers are a technological innovation which has not yet been extensively studied, there is a need for more systematic information about the extent and nature of their effects on society or individuals (for reviews see Caporael, 1984; Rosenberg, 1986).

Much of the recent scholarly literature and research is focused on issues related to the social context in which computers are used, especially the workplace and educational settings. In business organizations

computers are widely used because of their efficiency, especially in carrying out routine jobs such as scheduling, billing, information processing and record-keeping (Gotlieb & Borodin, 1973; Kling, 1980; Kling & Scacchi, 1982; Rosenberg, 1986). The possible effects of automation, especially computers, in the workplace has been extensively discussed (for reviews see Kling & Scacchi, 1982; King & Kraemer, 1980; Kling & Iacono, 1984; Rosenberg, 1986). Fear of unemployment and deskilling of workers is expressed by some (Braverman, 1974; Noble, 1978). Others, however, argued that computerization would upgrade white-collar workers because it would absorb more of the manual work, leaving workers to more satisfying and interesting tasks (Bell, 1973; King & Kraemer, 1980; Guiliano, 1982, Strassman, 1985). Most of the relevant empirical studies to date do not support the assumption that workers would feel degraded or would have less job satisfaction; effects, if any, were generally in the opposite direction (Kling, 1980; Kling & Iacono, 1984; Hunt & Hunt 1986). (For an extensive review and more recent studies see Kraut (Ed.), 1986).

Another place in which there is widespread computer use is in schools (Hassett, 1984; Chen, 1985; Becker, 1985; Anderson, 1986). The ability to use computers and

familiarity with the way they work is considered necessary for children's futures, and many writers express worry about those who are "left behind". Although there is a widespread belief in the beneficial effect of computers (see Papert, 1980; Klieman, 1984; Stein & Linn, 1985; Clements, 1986), the actual impact of computers in educational settings is not yet known (Community Service Society of New York, 1984; Paisley, 1985; Pea, Kurtland & Hawkins, 1985). It appears that in most schools computers are used mainly to teach programming, while other, potentially more innovative uses are rarely encountered. Explanations offered for narrow range of use are lack of adequate software, resistance by teachers, and general skepticism as to actual educational benefits from computer use (Weizenbaum, 1984; "Schools' use of computers", 1984; Giacquinta, et al. 1984; Holden, 1984; Becker 1985). (For an extensive review see Children and Micro Computers edited by Chen and Paisley, 1985).

Information regarding the use of computers in settings other than organizations, such as the workplace and schools, is limited. Despite a vast number of journal articles and popular books on this subject, there is little information about individuals who use personal computers in their home. Most of what literature there

is regarding individual users is still based on personal observation and provides interesting but idiosyncratic impressions and interpretations. Since personal computers are a new phenomenon which grows and changes rapidly, conclusive empirical research and a clear theoretical framework are lacking (Caporael, 1984; Lieberman, 1985; Rosenberg, 1986). Nevertheless, it is clear at least that the special characteristics of computers play an important role in the discussion of their potential influence on individuals.

Characteristics of the computer

It has been frequently suggested that an important characteristic of the computer is that it is a machine which requires rational and logical thinking by a user. The computer operates by "examining, erasing and writing symbols as it applies its rules... To process information [means] to replace discrete symbols one at a time according to a finite number of rules" (Bolter, 1984, p.44). In order to be able to operate it the user is required to communicate with the computer in a very specific way, which utilizes logic, sequential thinking and some knowledge of programming or at least of operating instructions. Therefore, people who use computers have to limit the range of their behavior to

what the computer "understands", and this involves mastering new and different modes of communication (Cathcart & Gumpert, 1983; Perrolle, 1983).

Computer logic creates a situation in which users must fit their cognitive processes to the way the computer operates in order to interact with it (Hiltz & Turoff, 1978; Gotlieb & Borodin, 1973; Weizenbaum, 1976; Perrolle, 1983). There are those who think that of this type of logical thinking is valuable and help the user in everyday activities and in abstract thinking (Papert, 1980; Stein & Linn, 1985). Others think that the benefits depend on the context in which programming is taught (Pea, Kurland, & Hawkins, 1985). Some expressed the fear that the kind of logical and rational thinking required for interaction with computers exclude a large range of human emotions and push values and attitudes toward more rational and less humanistic ones (Gotlieb and Borodin, 1973; Perrolle, 1983).

As for the effects on programmers who work extensively with computers, Weizenbaum (1976) warns that work with computers creates a preference for linear and logical thinking over more emotional and humanistic thinking. Bolter (1984) suggests that some of the people who work with computers develop a special way of thinking. He calls them "Turing's Men" - programmers

that see parallels between their thinking and the computer's processes. They create their own confined logical universe in the machine, a process which is like a game because they can always rearrange its elements. Turing's men are analytical but superficial and lack emotional intensity because "depth will not help the programs' operational success" (p. 221).

One criticism of the importance given to the special mode of communication required to operate computers is that there are considerable differences among computers in the adjustments required from users. These differences depend on the "friendliness" of the system and the software used, on specific uses, and on users' personalities (Weizenbaum, 1976; Veer & Wolde, 1983; Lucky, 1984; Kay 1984; Turkle, 1984). Increasingly, many users do not have to interact with the computer in the "optimal", structured and rational way but can find computers which are designed so the amount of knowledge of special modes of communications required to operate them is minimal. Some computers are even designed to be operated by the human voice.

Another characteristic of the computer which affects the computer-user interaction is that, on the mechanical level, a user cannot "see" how the machine operates. Its operation is very complex and there is no simple,

physical manifestation of the machine's abstract symbol manipulations or of the user's actions. This permits exaggerated and incorrect attributions of the capabilities of this technology (Weizenbaum, 1976; Perrolle, 1983; Turkle, 1984). A different type of complexity, also created by the computer's unique structure, results from the large number of possibilities of use the computer offers. These possibilities exist because of the large variety of available software which alter the computer's functions according to users' needs. The computer, then, is a shell, a framework which would be perceived differently by its users depending on the specific applications used. For many users the computer IS the software they use (Turkle, 1984; Kay, 1984; Sheingold, Hawkins & Char, 1984).

Compared to a machine whose function is clearly circumscribed (e.g. a car or a telephone), a computer allows for a large number of different applications. Unlike many other technological innovations it is also an interactive technology which requires active involvement from its users and gives almost immediate feedback. This complex interaction depends, however, on some basic "literacy" and unlike circumscribed machines, its possibilities increase as the user becomes more knowledgeable (Cathcart & Gumpert, 1983; Lucky, 1984;

Paisley 1985; Chen, 1985). Computers can carry out operations which vary with software so that the more a user learns the more its possible functions are revealed. Expansibility and interactive properties are the main strength of the computer, making it useful for many--some say limitless--different types of requirements and needs.

However, the complexity of the computer, coupled with the sophistication of its operation and the fact that such operations are "invisible" to users, allows for misattributions as to the manner in which it operates. It can become relatively easy for users to have idiosyncratic interpretations and ideas as to how it works and what it can do. For users who have problems operating or understanding the computer, there is the possibility of seeing the computer as an independent omnipotent magical entity. Such users might feel that they serve the computer rather than being served by it, creating feelings of inadequacy, powerlessness and alienation (Gotlieb & Borodin, 1973; Weizenbaum, 1976; Hiltz & Turoff, 1978; Perrolle, 1983; Turkle 1980, 1984).

For people who understand more of the ways computers work and who know how to manipulate them, the world that the computer offers might be more tempting than "real life." It offers the knowledgeable user a dependable and reliable form of interaction with an immediate feedback

and almost infinite possible uses. This might create a situation of total absorption in which users immerse themselves in the private universe they create on the computer and disconnect from the rest of the world (Weizenbaum, 1976; Gottlieb & Dede, 1982; Lee, 1982; Levy, 1984; Bolter, 1984; Kay 1984; Turkle, 1984).

"Addicted" computer users who are fascinated by the machine and spend most of their time using it are called "hackers". Although there is no clear definition in the literature of who "hackers" are, many writers who are intrigued by the computer hacker have some consistent descriptions of their behavior. They were first described by Weizenbaum (1976) as compulsive programmers who spend a great deal of time around the computer and behave in a way similar to addicted gamblers. In addition to their being engrossed by the computer, hackers can be recognized by their programming style. It is intuitive, not structured, based on trial and error rather than relying on systematic work or on theory, and is rarely documented. "Hackers are noted for building up long, complicated, undocumented programs on the fly literally overnight, without elaborate planning. Then they settle in for intensive "debugging"..." (Wilkes, 1983 p. 1). Usually the behavior of hackers is contrasted with that of structured programmers, who work

systematically, have more general knowledge and document what they do (Turkle, 1984; Wilkes, 1984; Levy, 1984; Weizenbaum, 1976).

Hackers are perceived by some as having a personality which needs absolute control, as being almost megalomaniac (Weizenbaum, 1976; Turkle, 1984; Bolter, 1984). Some describe them as loners who are motivated by their success in controlling the machine (as opposed to their inability to control their social life or establish close interpersonal relations). Others perceive them as original, nonconventional and innovative and compare their style of work to this of artists (Weizenbaum, 1976; Wilkes, 1984; Turkle, 1984; Levy, 1984).

Issues for Research

The literature describing individuals' use of computers is compelling but it does not offer a consistent conceptual framework nor is it grounded in empirical research. In order to investigate some of the assumptions and assertions raised, it is necessary first to clarify the major issues. These can be divided into three general categories: relations between computer and user, sense of control over one's surrounding by individual and the way it is related to computer use, and

identification of different types of computer users as reflected by their computer-related behaviors.

A. Relation between computer and user

Users' relations to the computers consist of the symbolic meanings computers have for their users, the affective component of computer use, style of work, and users' understanding of the ways computers operate. These relations are reflected by different perceptions, images, and feelings evoked by computers rather than by the way computers are used. Knowledge and understanding of computers and users' style of work appear to be more indicative of users' personalities and interests than the specific tasks for which computers are utilized (Weizenbaum, 1976; Turkle 1980, 1984; Perrolle, 1983; Chen, 1985; Paisley, 1985).

Users' understanding of the machine is frequently mentioned as a very important factor in the way he or she perceives it and relates to it. Turkle (1984) and Weizenbaum (1976) argue that the fact that most people do not understand how a computer works facilitates misperception of its attributes. Perrolle (1983) adds that this lack of understanding creates a distance from immediate experience, anxiety, a sense of alienation, and a perception of the machine as a magical, autonomous

entity. Knowledge of how the computer operates is an important part of the way users communicate with the machine.

Most frequently mentioned in the literature is style of work, notably hacking and structured programming. Turkle (1984) contrasts two styles of computer-user interaction: one is very planned and structured while the other is intuitive and interactive. It has been argued that style of use is a reflection of users' personality as well as their attitudes toward and relations with computers (Weizenbaum ,1976; Turkle, 1980, 1984). For example, although structured programming is considered to be a better way to interact with the computer, since it is more efficient, less error prone, and easier for other users to follow (Weizenbaum, 1976; Green, Payne, & Van der Veer, 1983), it was perceived by computer hackers as a sign of weakness because it meant they could not do it all in their heads (Weizenbaum, 1976). It is possible, however, that style of work on the computer is a function of experience and training and not of psychological disposition. Green et al. (1983) claim that while structured programming is recommended as more efficient and comprehensive, novice users find it very hard if not impossible to work with. Interestingly, none of this debate about programming covers what in fact has become

the major use of computers--applications using widely distributed software requiring almost no programming knowledge. It is reasonable to assume that users of applications software demonstrate different styles of work, but since they do not create the software and have only limited options of modifying it, the differences in work styles would not be as pronounced and dramatic as among programmers.

The affective component of computer use is also an important factor in users' subjective relations with computers. The way people feel about computers is related to their perceptions of computers, their computer use, and the role computers play in their life. The feelings that computers raise in some users range from fascination and pleasure, to fear and anxiety (Weizenbaum, 1976; Perrolle, 1983; Turkle, 1984). Knowledge about the characteristics of people who express different feelings is important for the understanding of the relations users have with their personal computers.

The symbolic image of the computer seems to constitute an important part of users' interaction with it. Turkle (1980) claims that there are subjective relations with the computer which "evoke strong feelings, carry personal meanings, create rich expressive environment". Kay (1984) talks about the "user's

illusion" of what the computer is. He claims that since for most users the computer is the software they use, and in "friendly" computers the way they really operate is hidden, users' perceptions of what computers are is seldom based on an objective reality.

B. The Control of Users over their Computers

The amount of control exerted by users over their computers, and the degree to which they perceive their control over their social and nonsocial environment seem to be an important aspect in computer use. Turkle (1984) describes the behavior of different types of computer users as a reflection of their need for control. "Hard masters," whose style of work is planned and structured, see the world as "something to be brought under control" (p. 115). "Soft masters", whose style of work is more interactive and intuitive, are more reactive and see the world as something they "need to accommodate to, something beyond their control" (p. 116). Weizenbaum (1976) claims that the engaging power of computers, especially in the case of compulsive programmers, exists because on one hand the programmers know they can make the computer "do anything", and on the other hand they do not always succeed. Thus, "the computer challenges his power, not his knowledge" (p. 119). Bolter (1984) sees

as the main feature of computer programming the creation of one's own universe, which programmers can rearrange according to the problem they work on.

In addition to control over the nonsocial environment, control of interpersonal relationships seems to also be related to computer use. According to Turkle (1984), most hackers give up "sex and romance" because they "expect more control over the other person than is reasonable" (p. 218). Levy (1984) argues that "it was the predictability and controllability of a computer system - as opposed to the helplessly random problems in human relationships - which made [computer] hacking particularly attractive" (p. 71).

It seems, then, that the dependability and reliability of computers relative to the unpredictability of interpersonal relationships might be connected to the attraction the computer has for the "addicted" computer users. These users might well be those who feel lack of control in their interpersonal environment and have the abilities and knowledge necessary for a successful operation, or "control", of their computer.

There is a problem, however, with converting "control", as used in the literature about computer users, into measurable terms. Control is a widely-used psychological construct, but there is no clear definition

of its meaning. Although it might not be what some of the writers quoted meant, control would be conceptualized in this study as the subjective perception of control rather than as actual control. The reason for this approach is that subjective perception proved to be more important in people's thinking and behavior (Lefcourt, 1982; Langer, 1983; Palenzuela, 1984).

C. Computer-related Behavior

In addition to users' images, emotions and mode of communication with the computer, an important aspect of users relations to the computer is, of course, activities which are actually related to the computer itself. The amount of time users spend working on their computer, social activities around it, such as borrowing software or belonging to user groups, type of software frequently used, extent of reading about computers, and level of computer expertise all describe of users' relations to the computer.

It seems reasonable to expect that different types of computer users would manifest different computer-related behaviors. One user type which is expected to emerge in the analysis is computer "hackers." This type is frequently mentioned in the literature as an important and noticeable group of participants of any computerized environment (at least around mainframe computers)

(Weizenbaum, 1976; Turkle, 1980; Levy, 1984; Wilkes, 1984). Other types of computer users mentioned are structured programmers (Weizenbaum, 1976; Turkle, 1984); timid users who find computer use difficult and even scary (Perrolle, 1983); and socially- oriented types (Kling, in press). Other possible types might be utility oriented users who use computers mainly for their work or users who do not need computers for their work and are not very experienced but enjoy the interaction.

Empirical Research

The existing research on computer users has barely investigated the issues raised in the literature about computer-user relations, psychological aspects or even types of users. Most of the research which does investigate empirically some of the issues raised has been carried out in schools (Chen & Paisley, 1985). Still, this research also lacks a theoretical framework specific to computers, and focuses mainly on the educational advantage computers offer children. The empirical research describing adult users of personal computers investigates mainly computer-related behaviors and the use of computer applications, although some also study the attitudes of user subpopulations towards the computer.

There exist empirical data on individual users which have been gathered for market research purposes. These provide some useful information as to the demographic and certain behavioral characteristics of computer users, but do not go beyond this (for summary see Rosenberg, 1986; Horwitz, 1986). In such research, computer users (usually readers of computer magazines) are asked demographic questions and some computer-related behavioral questions such as number of hours of use, types of software and hardware acquired, and type of work done. However, these data are mainly a description of a self-selected population of personal computer users and of their interests and do not directly address the issues raised here.

More in-depth empirical investigation of the use of computers by individuals has usually been exploratory in nature and has not differentiate between mainframe computers, personal computers, and less powerful home computers. Turkle (1984) used ethnographic data on personal and mainframe computer users which were collected over five years. She argued that because of their complexity and large number of possible uses, computers are a projective tool, and mean different things to different people. Thus, she describes computers as an extension of the self, and the manner in

which they are used as a reflection of the user's personality. The amount of control over the computer is described by her as a major factor in the attraction of different users to the computer and in the way they use it. Turkle's research is the only one which focuses on the symbolic meaning of computers, and provides psychological underlying constructs which can explain users' behavior. However, although her study provides interesting insights into the behaviors of individual users, it does not have clear answers for most of the issues she herself raised and interpretations of the observations in the study were selective and impressionistic.

Hiltz and Turoff (1978) reported on their experience as participant observers in communications using the computer. They pointed out that the qualities of the computer, which can be seen as impersonal and dehumanized, create the anonymity which allows equality and frankness in communication between users. They suggest that out of these communication patterns a new subculture with special rules and norms might develop. Hiltz (1983) studied patterns of communication of computerized conferencing, and found that the level of usage of computers was determined more by social structural variables such as the participants' level of

anticipated computer use and their relationships with other users, than by technological aspects.

Zoltan and Chapanis (1982) surveyed professionals (CPAs, lawyers pharmacists and physicians) about their experience with and attitudes towards computers (response rate of 27.7%). They found that CPAs had most experience with computers while lawyers had the least experience. Three main clusters of attitudes among the users were found: computers as an efficient machine, dissatisfaction with the depersonalization and complexity of computers, and seeing working on computers as stimulating and challenging. Lee (1970) found two main attitudes towards computers: Positive attitudes describing computers as beneficial tools and negative attitudes describing them as superhumans which might downgrade human uniqueness. Coovert and Goldstein (1980) found that people with internal locus of control have more favorable opinions of computers than people with external locus of control.

Gottlieb & Dede (1982) conducted a survey of 75 users of the Apple personal computer. This study, which focused mainly on descriptive information. Barriers to buying were found to be cost, intimidation, confusion as to which brand to buy, uncertainty as to its practicality, and fear of obsolescence. Once the computers were purchased, the users bought more

peripherals, read computer-related materials, enrolled in courses, and joined user groups. Most users did not attribute anthropomorphic qualities to the machine. Many enrolled in computer literacy courses and others had previous experience at school or work.

McQuarrie et al. (1984) conducted a survey of 223 home computer users. They found prior behaviors to be better predictors of intended behavior than attitudes. Most respondents had previous computer experience and were very satisfied with their computers. The main uses were learning about computers, record keeping, and games.

Dickerson & Gentry (1984) studied creativity in adopters of home computers as a function of two personality dimensions, originality (origence) and intelligence. Creativity was measured by "life style" questions. They found that home computer adopters were more likely to exhibit what they called "low origence / high intelligence" (introverted, nonsocial, rational, quantitatively oriented) characteristics. In addition, home computer adopters had more experience with a variety of technical products than non-adopters.

Focus on personal computers used at home

The existing research and literature concerning individuals who use computers lacks differentiation

between different types of computers--between home computers, personal computers and larger mainframe and mini-computers. The relations of individuals to their computers appears to be affected by the type of machine they use. Mainframe computers are considerably more powerful than personal computers in terms of their memory, speed, storage capacity, and information processing capabilities. They are also much more expensive and require a special organization to handle them. Users of such computers usually do not have much control over the selection of computers, their software, usage, or even the decision whether or not to buy them. Home computers on the other hand, are less expensive (less than $1000), have more limited capabilities and are not as powerful. Personal computers are therefore the optimal choice to study user-computer interaction. They are powerful enough to offer their users large possibilities of uses and application, and inexpensive and manageable enough for private individuals to acquire and use.

The optimal environment for the study of the issues raised about individuals use of computers seem to be the home. At home an individual buys a computer for self-guided reasons, and can exert personal control over its use as well as responsibility for its operation and

maintenance as a complete system. In addition, although many use computers at home for business purposes, their users are free to choose other applications such as programming, games, communications, and word processing computers rather than being limited to use as a business tool as they would in the workplace. Finally, there is the stronger personal symbolic meaning of things a person chooses to keep at home. Things that are kept at home seem to play an important role in peoples' definition of who they are, and constitute an expression of one's self. They can also be seen as an expression of a person's ability to control their environment (Csikzentmihali, 1981). It seems, then, that computers used at home are particularly susceptible to the role of objects onto which people project their psychological needs and expectations. They thus provide an optimal setting for investigating person-computer interaction.

The Present Study

The present study focuses on individual users of personal computers at home. The study investigates some of the issues raised in the literature review through the method of survey research. A sample of personal computer owners received a questionnaire (written on a computer diskette) which was sent to their home. In the survey,

questions about users' feelings and images of computers, computer-related behavior, and perceived control were included (in addition to questions which were part of a larger study). An exploratory investigation of computer users in different settings was undertaken in a pilot research project which served as an initial step before the survey was conducted.

1. The initial pilot research

The pilot project was conducted during 1984 and 1985, prior to preparing the survey questionnaire. Computer users were observed in diverse settings; in three different users groups, in a mainframe user room. In addition, thirteen personal and mainframe computer users were informally interviewed. The issues raised in the literature review, images feelings, amount of knowledge, users types, and interpersonal relations with other computer users, were included as an outline of questions presented to the interviewees (see Appendix B) who were encouraged to discuss them in an unstructured way.

Our impression based on the pilot research is that most of the issues raised in the literature can be observed in users' behaviors. Different user groups seemed to belong to different subcultures, which appeared

to be inherent in the different types of machines and the nature of the users who preferred working with them. The two groups which the participant observation focused on were IBM and Macintosh user groups. The most noticeable differences between these two groups seemed to be the amount of knowledge users in the IBM and Macintosh groups thought was necessary and the way they treated novice or "ignorant" users. Many mainframe users who had no choice but to use the computer lacked the enthusiasm of the personal computer users. Individuals who were doing something they did not understand with computers such as new owners of personal computers who tried to assemble a new personal computer or a novice starting to work on the mainframe, expressed feelings of confusion, fear of destroying something, low confidence in one's ability, and anxiety.

None of the personal computer users interviewed described themselves as computer hackers. Only one of the interviewees, who was an experienced mainframe user and a computer science major, had personally encountered computer hackers. His description was similar to that of Weizenbaum (1976); technicians who lack general understanding of computers and whose main concern is building programs that "work" no matter how.

All interviewees were able to describe some images and feelings the computer provoked in them. Some interesting differences which emerged in these interviews: people with similar interests and uses for the computer had different subjective images of and feelings about computers, while people with similar images had very different interests, expertise, and uses. (For summary of the pilot research see Appendix A)

2. The present study

The present study focuses on the individual user of a personal computers at home and sought detailed empirical information about the ways individuals use and perceive computers, and some of the the psychological factors involved. What computers mean to their users seems to be at least as important an aspect of the potential impact of this technological innovation as what users actually do with computers. Based on the relevant literature and on pilot interviews and observations, three general areas of interest emerged as salient in individuals' use of computers.

On the sociopsychological level, personal and interpersonal control seemed to be the most important construct. It has been claimed repeatedly that the controllability and predictability of computers are their

main source of attraction, and that individual differences in control can explain different types of computer use (Weizenbaum, 1976; Turkle 1980, 1984; Levy, 1984; Bolter, 1984). Systematic empirical evidence is needed.

It was already mentioned that although control is a widely-used psychological construct, there is no clear definition of what it means. Control is usually conceptualized by psychological researchers as the subjective perception of control rather than as actual control (Lefcourt, 1982; Langer, 1983; Palenzuela, 1984). In most of the literature, control has been conceptualized as a rather stable disposition, an aspect of personality which is affected by previous (especially childhood) experiences, but which can be changed by positive or negative experiences, stressful life events, and illness. Predictability was usually seen as a factor which may influence the perception of control (Lefcourt, 1982; Langer, 1983; Baum & Singer, 1980).

Conceptual confusion in the literature related to control has been created by the use of the concepts of "locus of control," "control expectancy," and "perceived control" interchangeably (for a review see Palenzuela, 1984). However, since in most of the literature there are no clear conceptual distinctions among these terms,

the definition of control is usually related to the ways in which control is measured and to the researchers' theoretical orientation. For the purpose of this study, the term "perceived control", which is more general than "locus of control" or "control expectancy", was used (see Paulhus & Christie, 1981; Palenzuela, 1984).

Rotter's (1966) scale for measuring locus of control has been most widely used as a control measure. This type of scale was initially conceptualized and constructed as a "generalized expectancy to perceive reinforcement either as contingent upon one's own behavior (internal control) or as the result of forces beyond one's control and due to chance, fate, or powerful others (external control)" (Levenson, 1981 p. 15). However, despite its wide use, there are serious methodological and theoretical criticisms of this scale. The two main points of the criticism are: a factor analysis of Rotter's scale reveals more than one factor while Rotter treats control as a unidimensional construct, Rotter's scale is generalized while there are specific situations in which a person might behave differently (for a review see Lefcourt, 1981, 1982).

There are a number of possible dimensions for a multidimensional locus of control, or perceived control, scale (see Lefcourt, 1981; Levenson, 1974, 1981; Ried &

Ware 1974; Paulhus & Christie, 1981; Paulhus, 1983). The scale proposed for use in this study is the Spheres of Control (SOC) scale which was constructed by Paulhus and Christie (Paulhus & Christie, 1981; Paulhus, 1983). The conceptual model underlying this scale is a partition of the individual's life space in term of primary behavioral spheres. The scale is divided into into three parts which conceptually represent three independent dispositions of expectancies of control in the different behavioral spheres. The three spheres are: 1) personal efficacy - the perceived control over one's nonsocial environment; 2) interpersonal control - perceived control in interaction with other people; and 3) sociopolitical control - perceived control in the larger social and political system.

This scale was selected because two of these three spheres of control are relevant to the concepts of this study. Personal efficacy is an important factor in the control users perceive they have over their nonsocial environment. It seems reasonable to assume, therefore, that personal efficacy plays an important role in the control that users feel they have over their personal computers and hence in their perceptions of them. Interpersonal control might influence people's attraction to computer use. People who perceive themselves as

having low interpersonal control might be attracted to this "safe" predictable entity. They would also be attracted to those aspects of computing which are the most "controllable", such as electronics and hardware. The third scale sociopolitical control did not seem relevant and was not included in the study.

The second area of interest is users' relations to their personal computers. Computers seem to have different meanings to different people and their impact cannot be understood without taking these meanings into account (Turkle, 1980, 1984). There is ,however, no clear definition in the literature of what constitutes users' relations to the computer or the possible components of these relations (Turkle 1980, 1984; Weizenbaum, 1976; Levy, 1984; Kay, 1984; Bolter, 1984).

In the present study, the attempt to describe and quantify these relationships relies upon on the information available in the literature, as well as on our pilot interviews of computer users and participant observations of user groups meetings. Individuals' subjective relation to the computers cannot be observed directly in users' behavior but some of it can be tapped through users' images and feelings of computers, their understanding the way the computer operates, and their style of work.

The third area of interest is computer-related behaviors which are either actual computer use or activities which surround the computer. The pilot research conducted so far indicated that even when people use the same computers and same software, there are differences in other aspects of their behaviors (such as emphasis on certain uses, reading computer magazines, knowing how to program, or computer expertise). A typology of computer users might be extracted from specific arrays of computer-related behaviors by clustering individual users.

Questions were included to elicit the "types" mentioned in the literature, especially hackers and structured programmers. User types could explain some of the seemingly unrelated computer-oriented behavior, such as belonging to users groups, using bulletin boards or using manuals. A detailed typology, however, depends on the result of the cluster analysis performed on the respondents' answers.

Hypothesized Relation between Individuals and Computers

A. Users' relations to the computer

The possible interrelations between the categories of relations with the computer raise interesting questions. In the literature it is argued that greater

understanding of the computer is related to positive images and feelings. Will the computer be less mystifying for users who have a better understanding of the way it operates? Is there any relation between style of use and which aspects of the computer people understand? What is the connection between the way people feel when they use the computer, its image, and the level of their understanding?

B. User Types

1. Analysis of computer-related behaviors, using the statistical procedure cluster analysis, might show clusters of different types of users. User types might explain observed, seemingly unrelated, behaviors of users. For example, hackers may belong to user groups, work more on the computer, read certain types of books and magazines, own several computers and feel their use of the computers is mainly for fun.

2. Interesting relations between user types and the subjective meanings of computers may be revealed. Hackers may understand the details of their specific machine, see the computer as a simple controllable tool, and feel computers are fun. Task oriented users may see the computer as a servant, have limited understanding of

its functions which are not related to their needs, and their feeling about computers might depend on the successful accomplishment of their goals.

3. Perceived control and computer use - users with high scores on the personal efficacy scale may be the type who knows how to utilize the potential of the computer either to accomplish their specific goals or to satisfy their own interests. Those who underutilize their computers might show low scores on the personal efficacy scale. All hacker types may have low interpersonal control.

C. User's perceived control and relations to the computer

Interesting relationships are suggested between the ways people use their computers, their subjective relationships with them, and control. Is the degree to which persons need to control their nonsocial environment a motive for interacting with the computer? If so, what type of interaction? Are there any relations between perception of control and the way the computer is used? It might also be the case that certain types of relations with the computer are related to certain types of control.

1. Understanding: a. The higher the personal efficacy, the higher the general understanding. Users

with lower personal efficacy would not try to understand more than they need, while users with high personal efficacy would like to understand this new and challenging environment.

b. It was suggested that the controllability and predictability of computers attract users with low interpersonal control. The knowledge of particular technical and electronic details of the machine gives an optimal control. Thus, the lower the interpersonal control, the higher the knowledge of these details.

2. Symbolic Image: a. Since they feel control over their nonsocial environment, users with high personal efficacy would see the computer as a useful tool which can be used to achieve their purposes. Those whose personal efficacy is low might have one of two reactions: some would see it as magic, something beyond their understanding, while others might reject the computer as a useless machine. It seems reasonable to assume, though, that in this study in which all respondents decided to buy a personal computer and to invest several thousand dollars, relatively few would see the computer as a useless machine.

b. Users who feel low interpersonal control would see the computer as a simple predictable machine since they need to feel full control over it; Those with high

interpersonal control might personalize the computer because they feel confident in an interpersonal context.

3. Feelings: a. People with low personal efficacy might report negative feelings of frustration and dependency. Those with high personal efficacy would feel a sense of accomplishment and control.
b. For users with low interpersonal control, the purpose of the work with the computer is as much the interaction itself as the accomplishment of specific goals. Therefore, they would feel an internal pleasure and absorption in addition to a sense of accomplishment and control; The direction of the feelings of users with higher interpersonal control is not clear; it might depend on their personal efficacy.

4. Style of Use - If the style of use is a function of experience and knowledge, rather than personality (as Green et al., 1983, suggested), psychological variables would not differentiate between users. However, if style is a reflection of users' personality and need for control (as Turkle and Weizenbaum suggested) then:
a. Users with high personal efficacy would prefer a structured, preplanned style which maximizes efficiency, and b. users with low interpersonal control would prefer an intuitive "hacker like" style. Since the work on the computer might be more a manifestation of personal power

for them, they would develop their own "personal style" rather than rely on a structured method. They would also be more concerned with specific details and not with the general theory required for structured work.

D. Demographic variables

It was found in previous studies that the majority of people who have home computers are middle aged, have high income, are well educated, and are professionals (Somerson, 1984; "The Byte readers", 1984; McQuarrie, et al. 1984; Dickerson and Gentry, 1984; Bunnel, 1985). Therefore, the sample of the present study might be too homogeneous in term of socioeconomic status, race, and education to explain the variance in the results. Variables which are not related to the socioeconomic status of the respondents might prove more useful.

1. Gender - Women use computers less and are less interested in acquiring knowledge about them (Chen, 1985; Lieberman, 1985). Women who use computers do not differ from men in the activities they used them for (Watkins & Brimm, 1985), but they also do not exhibit the "hacker" syndrome manifested by some of the men (Levy, 1984; Turkle, 1984; Lepper, 1985). Since all our respondents are computer buyers, analysis of the answers of our sample can not explain the difference in computer use

between genders. It is interesting, however, to investigate the presence of differences between men and women who already use computers. How much and what aspects do women, as compared with men, want to understand about computers? Are there any differences in feelings and images? Are there gender differences in users types? What is the relationship between control and gender?

2. Occupation - People's occupation reflects some of their interests, skills, and experience. Since particular skills, such as mathematical ability, seem to be related to efficient use of computers (Veer & Wold, 1983), users' type of occupation might explain some of their computer use. Occupation also might be related to users' sense of control. It is hypothesized that user types who are involved with the computer and use it for most activities would have occupations involving computing, mathematics, or exact sciences

3. Age - It is argued that current reactions of individuals are largely a matter of generational effects. Older people are untrained in computer use and therefore fear and resist it (Caporael & Thorngate, 1984). It is hypothesized that more older than younger people would belong to user types which are less involved with computers.

CHAPTER TWO

METHODOLOGY

A. The Pilot Study

A pilot study was carried out (in 1984, 1985) in order to accumulate information about computer users, and to develop a workable questionnaire. It had three parts: 1) Participant observations of computers users. Several kinds of groups were observed: IBM personal computer user group monthly meetings, Macintosh user group monthly meetings, Sanyo user group meetings, and mainframe computer users in the university's computer center. 2) Participant observations on three occasions when users opened packaged personal computers and tried to assemble them. 3) Informal open-ended interviews with personal computer users (Macintosh and IBM or IBM compatibles), and experienced mainframe users. (See Appendix A for more detailed description of the pilot research, and Appendix B for the interview schedule)

B. The Present Study

1. The Sample

The sample consisted of respondents who use IBM personal computers or compatibles at home. These personal computers were selected for several reasons. First, they are more sophisticated and have more extensive capabilities than the simpler home computers. Second, of the more complex personal computers, these are the most popular. Third, it was not economical to try and cover all possible personal computers because the questionnaire for the study was written on a computer diskette, and different types of computers require different types of diskettes and special programming. Since the present study is part of a larger study, the method of sampling was not directed only to people who use personal computers at home. However, only home-users were included in the analysis of the data.

Since it was impossible to get lists of buyers from computer manufacturers (surprisingly most of them do not even have lists), the sample was selected to represent different possible kinds of computer users. Therefore the sample in the study was selected from four very different starting points:

1. A major campus of The City University of New York (CUNY). All faculty members were asked in a short

questionnaire whether they had bought a personal computer. 85 names were randomly selected out of those who said they have a personal computer. The response rate was 50.6% (43 complete questionnaires)

2. Invoices of recent purchasers of computers from a full service computer store. 80 names were randomly selected and sent the questionnaire. Out of these names, three were unreachable and one had sold her computer. The response rate of the rest was 43.4% (33 out of 76).

3. computer user's group. 70 names of members of an IBM users group were randomly selected and sent the questionnaire. The response rate was 51.4% (36 complete responses out of 70. One person sent the disk back but erased it after objecting to one of the questions (income), and this response was counted as refusal).

4. Mailing lists. 70 names were randomly selected from a list of buyers from mail order houses. The mailing list proved to be unreliable; 19 of the original seventy either had the wrong address, did not have a computer or were unreachable. Of the 51 remaining respondents, the response rate was 43.1% (22 out of 51).

5. Since the larger study focused on networking, the rest of the sample was supposed to be sampled as a snowball (random selection of 3 names out of a maximum of 10 people with whom they interact on computer-related

issues). However, the snowball selection took time because first, the initial samples have to be processed and since snowballing is not an important part of the present study, and there were time constraints, only the first wave that was sent was used. The response rate of the snow ball sample is lower than for the rest of the samples, out of 109 diskettes sent, 28 were sent back (25.6%).

To sum up the response rate: out of 391 questionnaires sent in which respondents were reachable (no wrong address or having no computer) 162 were returned (41.4%). When the snowball sample is excluded, the response rate is somewhat higher (47.5%, 134 out of 282). Goyder (1985) reviewed methodology textbooks and the literature on survey response rates of mailed questionnaires and presented variety of estimates of "realistic" response rates ranging from 30% to 60% and even 70%. Thus, the response rate to the questionnaire written on computer diskette in the present study seems to be similar to the response rates of mailed questionnaire written on paper.

When people who did not return the questionnaire were contacted, either by phone or by a one-page mail questionnaire, some said they did not have time for answering the questionnaire. Many others, however, said

(by either by answering a one page questionnaire or in a phone conversation) they did not know how to start it, or download the freeware provided as a gift for answering the questionnaire. Thus, although all users owned a personal computer for at least six month, many knew how to use it only for their specific needs and could not even handle the diskette questionnaire which had (what we thought) clear and simple instructions for use. These kind of respondents are very important for a study of computer users, and it is unfortunate, that they were not part of the sample of this study.

Some of the respondents did not use computers at home. Since the present study focuses only on people who use the computer at home (usually in addition to other places such as work or school), respondents who do not use computers at home at all were excluded from the sample. The final number of respondents was therefore 141 (39 from CUNY campus, 31 from computer stores, 19 from the mailing list, and 22 from the snowball sample).

2. The Questionnaire

The questionnaire was written on computer disks, and sent to respondents by mail. It took about 12 months longer than expected to program a workable questionnaire, especially since a pilot study conducted on the initial

questionnaire which was written in Basic had found it too slow, and the questionnaire had to be reprogrammed in C language. It was our hope that using this medium would raise users' curiosity and openness to respond. Kiesler & Sproul (1986) report that although there is a similarity between the response rates to paper and electronic questionnaires, the electronic questionnaires had elicited more socially undesirable responses. In addition, it was hoped that the response rate would consequently be higher than usual in such a survey (as reported above, the response rate is not higher than response rates estimated for paper mail questionnaires).

Summing up, the general issues this study focused on are: control, feelings while working on the computer, perceptions and understanding of the computer, computer use and computer-related behavior. The operationalization of these constructs is based on the relevant literature reviewed and on our pilot interviews and participant observations.

C. Operationalization of the Issues

1. Control

The items of the SOC scale (Spheres of control, constructed by Christie & Paulhus, 1981) appear in Section 6 question 6 in the questionnaire (see Appendix

C). The SOC scale has high reliability and validity. The reliability of the scale is .75-.85 on cross-validated samples. Its construct validity was checked by demonstrating predictable relationships with previously established scales: machiavellianism, Rotter I-E, and Marlowe-Crowne. In addition, the scale was validated by finding the predicted behavior of people who had different scores, and the predicted scores of people who belonged to different sport groups.

There is a potential problem with regard to the SOC scale. Although responses of men and women on the locus of control scale have similar means, standard deviations, and factor patterns, their answers within factors are somewhat different. Men with high internal locus of control emphasize influencing others while women emphasize self direction. Men with high external locus of control emphasize luck, while women emphasize personal influence. In addition, the locus of control scores were found to be predictive of academic performance for men but not for women (for a review see Strickland & Haley, 1980). The SOC scale has not yet been checked for gender differences. To my knowledge, there is no other control scale which is suitable for the present research and is free of these potential biases. However, since some of the SOC's items are similar to the Rotter's items, and

since there is a difference in computer use between men and women, a possibility of gender differences was taken into account in the analysis. A better solution from a scientific point of view would be to use an additional control scale which cover different dimensions than the SOC scale in order to create a more generalizable control construct. Unfortunately, there was a considerable likelihood that the use of two control scales, in addition to the other questions, in a self-administered survey overload the respondents and reduce their response rate.

2. Relations with the computer

A. understanding

Indicators for users' understanding were the types of knowledge they consider important: Knowledge which is limited to immediate needs, levels of programming expertise, knowledge of general theoretical issues, knowledge of details of the electronics and hardware. Specifically, these indicators appear in Section 6, questions 2 and 3 in the questionnaire (see Appendix C).

B. Style of use

Two different types of style of use were studied - intuitive style versus structured preplanned one. Three

questions asked users opinions about trying out things rather than using the manuals, improvising while working on the computer, and documenting their work. The indicators of style of use are in Section 6 items a, c, and f in question 5 in the questionnaire (see Appendix C).

C. Feelings

The way people say they feel when they use their computers is part of their subjective relations to it. Indicators of feelings when the computer is used were items presented in the Semantic Differential technique, specifically, in Section 6 question 1 in the questionnaire.

D. Images and perceptions

Since images depend on the latent, rather than the manifest characteristics of computers as objects, it seems reasonable to assume that they would be reflected in users' subjective descriptions and metaphors. Respondents' ratings of attributes and images ascribed to the computer, and some of their descriptions of their experiences when using computers, serve as indicators for their symbolic images. The indicators are in Section 4

question 20 and in Section 6 question 5 item g (see Appendix C).

3. Behavior

In order to achieve comparability with other studies on computers, some of the questions about prior computer-related behavior were taken from previous surveys on this topic (McQuarrie, Langmer & Gleser, 1984; Gottlieb & Dede, 1982; Consumer Report, 1985). The questions asked about barriers in buying a computer, computer expertise, type of activities, satisfaction, earning money. The rest of the questions covered the aspects which are of interest in this study and were not included in the above surveys. The indicators of actual behavior are presented in the questionnaire (see Appendix C), and the questions used are specified in the results section.

The questions used for clustering user types are: in Section 2 question 2 and in Section 4 questions 11, 13, 18, and 19.

CHAPTER THREE

RESULTS

Description of the sample

1. Demographics

The sample in this study is quite homogeneous (as was found in previous studies of computer users at home). Most of the respondents are upper-middle class white men over 30 years old. The sample consists of 75.9% males and 24.1% females. The age of 81% of them is between 30 to 55 years, (M=42.09, SD=10.61). Three of our respondents are high school students. Most of the respondents are highly educated, even when about a quarter of them who are faculty members are omitted. When the three respondents who are still in high school are excluded, 98% have at least some college education and of them 23.9% are college graduates, 25.4% have a master degree, and 42.0% have a Ph.D. or a professional degree. The occupations of most respondents are professional or managerial. Only some are computer specialists, about 21% are computer specialists or computer consultants. The occupations of the rest range from writers and social scientists to accountants and

executives. Most of our respondents have high income. 54.6% earn $65,000 or more, and 92.2% earn more than $30,000. 85.7% of the respondents are white, 4.3% are black, 0.7% are Hispanic, 9.3% are "other".

2. Buying a Computer

Most of the respondents put a great deal of effort into buying their computers (57.9%), only a few (4.3%) did not expend much effort. The most important sources of information for buying a computer are those which are computer specific: computer magazines (28.3%) and computer specialists (23.2%). Other people are an important source as well. Respondents consulted people at work (17.4%) and friends (11.6%). The most important reason for buying a specific computer is its price (20.2%), next is having the same at work (17.8%). Reasons which are specific to the computer come only later (good evaluation 15.5%, company's reputation 12.4%, software availability 10.1%, and design 7.0%), last are recommendations of friends (7.8%). About a third of the respondents did not see any important barriers to buying a computer (31.9%). For the rest, expense was again an important reason (19.8%), and then confusion as to which computer to buy and need for information (15.6% needed more information, 14.6% were not sure they needed any,

11.5% complained about lack of help from sales people, and 11.5% wanted to wait for newer and better models).

3. Users and the computer.

The majority of the users are extremely satisfied with their computers (72.3%), for many the rewards of using the computer were greater than expected (68.8%), while few had more problems than they expected (23.4%). About fifth of the respondents are new users who first used a personal computer less than a year ago (22%), the rest are more experienced users, and some have used a personal computer almost since it appeared in the market (12.8% first used it more than 10 years ago). About half (50.4%) know how to program in at least one computer language. 26.2% describe themselves as beginners, 36.9% as intermediate users, 23.4% as advanced users, and 13.5% as computer pros. In fact only 16.3% consider themselves hackers. While 11.3% of the respondents use their computer for less than an average of 4 hours a week, most of the users use their personal computers between 5 to 20 hours a week (56.7%), 11.3% use it for 21 to 30 hours, 11.3% use it for 31 to 40 hours, and 9.2% use it for more than 41 hours. For more than half of the sample (50.4%), almost all their personal computer use is related to their work, while for only for 7.8% almost none of their computer use is related to work. Many read books about

computers (62.4%) and computer magazines (52.5%). 39% belong to a user group. For most time passes more quickly while they use the computer (81.6%).

4. Computer use

When asked about the most important use of their personal computer, about half the sample finds word processing to be the most important (51.8%), while the other important uses are financial (17.3%), record keeping (7.2%), programming (10.8%), scientific work (5.0%), and children education (2.2%). No one mentioned games as the most important (see table 1).

Table 1
The most important computer use

	N	Percent
finance	6	4.3%
banking	1	0.7
communication	2	1.4
word processing	72	51.8
writing programs	11	7.9
children education	3	2.2
games	0	0
tracking investments	3	2.2
accounting	14	10.1
mathematic/scientific work	7	5.0
graphics and art	1	0.7
databases	2	1.4
record keeping	10	7.1
learning programming	4	2.9
other	3	2.2
Total	141	100%

The majority (69.1%) thought the computer will help them with their work, increase their job opportunities

(7.9%), make their life easier and more convenient (9.4%), and generally be a challenge and fun (see table 2).

Table 2
What the computer can do for you

	N	Percent
make life easy	8	5.8
improve mind	5	3.6
be a lot of fun	2	1.4
help with work	96	69.1
sense of accomplishment	1	0.7
job opportunities	11	7.9
social recognition	0	0
learn about computers	4	2.9
help my children	2	1.4
make life convenient	5	3.6
other	5	3.6
none	2	1.4
Total	141	100%

The Control Factors

The control scale used in the study was constructed by Paulhus and Christie (1981). The initial scale was made of 3 ten-item subscales: personal efficacy, interpersonal control and sociopolitical control. Only two subscales were used in this study - personal efficacy, and interpersonal control. Half of the questions in each subscale were positively keyed and half were negatively keyed, but when the items were analyzed,

the direction of those which were negatively keyed was changed so that in all items the direction is positive (a higher score means higher control). The 20 items which were included in the questionnaire were factor analyzed in order to determine whether the two original control subscales could be validated.

The factor analyses conducted in this study used the maximum likelihood method to obtain estimates of the common factors. This method provides chi-square statistics of goodness-of-fit tests for the adequacy of a k-factor model. It should be emphasized, however, that when the distributions of responses are not normal the the chi-squares which are used as indicator of the goodness-of-fit of factor models can be inflated and the probability values (p) might not be correct. Since most of the items used have 5-point scales and some have 3-point scales, it is probable that some of the chi-squares reported are not accurate. Thus, the chi-square values are used as indicators of goodness-of-fit of k-factor models with caution. The eigen-values of the factors would be used as additional indicators for the optimal number of factors which fit the data.

The maximum likelihood factor analysis of the 20 items Paulhus and Christie's control subscales the showed that the data did not fit a two-factor model

(χ^2(151,N=141)=265.281, p=.00001;). The data also did not fit a three-factor model (χ^2(133,N=141)=208.557, p=.00001) or a four-factor model (χ^2(116,N=141)=171.653, p=.0006). However, there was a good fit for five-factor model (χ^2(100,N=141)=113.432, p=.169), and a significantly better fit for a six-factor model (χ^2(85,N=141)=86.785, p=.426; χ^2difference(15,N=141) =26.647, p=.032). The eigen values of the factors show no distinct break in the scree plot. The eigen-values range from 2.79 for the first factor, 1.00 for the fifth factor and 0.64 for the sixth factor. Thus, since from the eigen-values five-factor model appears to be adequate to represent the data, the goodness-of-fit chi-square might be inflated, a five-factor model was chosen as the

The factors for a five-factor model with varimax rotation (see table 3) are:

1. Items which are related to interpersonal control, mostly in group situations: "easy to play important part in most group situations" (V285), disagree with "difficult to get others to help when needed" (V292), disagree with "not good guiding the course of conversation with several others" (V300), disagree with "hard to get my point of view across to others" (V302), disagree with "when try to smooth over disagreement make it worse" (V303) .

2. Items which are related to achievements of one's goals and manipulating for that purpose: "when make plans almost certain to make them work" (V286), "can learn almost anything if set my mind to it" (V288), "can steer an interviewer towards the topics I want" (V289), "if there is someone I want to meet I can usually arrange it" (V293), disagree with "competition discourages excellence" (V294).

3. Items which are related to achievement thorough hard work and self reliance: "when I get what I want it's usually because I worked hard for it" (V284), "my major accomplishments are entirely due to my hard work and ability" (V290).

4. Items which are related to personal relationships, and friendship: "I have no trouble making and keeping friends" (V298), "I can usually establish a close personal relationship with someone I find attractive" (V301).

5. One item only : "I usually don't set goals because I have a hard time following through on them" (V291). This item does not seem to have a special meaning which requires using it as a separate construct, and was therefore be dropped from further analyses. most adequate.

Table 3
Factors loading of all the control items; 5 factors in varimax rotation (N=141)

	FACTOR				
ITEM	1	2	3	4	5
V284	-.078	.154	.691	-.065	-.078
V285	.398	.237	.038	.178	-.016
V286	.060	.624	.256	-.003	.200
V287	-.096	.033	.249	-.078	.204
V288	.090	.440	.240	.064	.160
V289	.160	.302	.323	.138	-.076
V290	-.011	.069	.781	.183	.056
V291	.038	.127	.142	-.005	.980
V292	.370	.115	.106	.135	.271
V293	.075	.531	.031	.139	.028
V294	.219	.435	.121	.078	.058
V295	-.005	.162	.219	-.102	.058
V296	.165	.030	.230	-.079	.012
V297	.422	.362	-.140	.080	-.046
V298	.150	.141	-.088	.974	.026
V299	.145	.070	.033	-.013	.210
V300	.438	.263	-.110	.152	.018
V301	.248	.275	.018	.472	-.033
V302	.986	.016	.110	.011	.116
V303	.425	-.010	-.082	.253	.322

Since the two factors conceptualized by Paulhus and Christie did not fit the data of the present study, the next step was to find constructs which could be used in further analyses. As was already discussed, two of the factors found in the initial factor analysis do not seem to represent clear underlying constructs. In addition, three items "prefers games with luck over games with skill" (V287), "people get ahead just by being lucky"

(V295), "I like to know how well I do relative to everyone else" (V296), and "It's pointless to keep working on something that's too difficult" (V299) did not load highly on any of the factors and could therefore be dropped from further analyses. Another item "the ability to control social situations" (V297) has high factor loadings on the interpersonal control factor (.42) and the achievement factor (.36). The meaning of this item is not clear and it seems to have more than one possible implications, it was, therefore, dropped from further analyses. Thus, the data were analyzed again without items V287, V291, V295, V296, V297, and V299.

Another factor analysis was run using the remaining items of the control scale (V284, V285, V286, V288, V289, V290, V292, V293, V294, V298, V300, V301, V302, V303). This analysis, which only includes the selected items, shows that a four-factor model fits the data very well ($\chi^2(41, \underline{N}=141)=0.64$, $\underline{p}=.88$). (The factor loadings are presented in table 4). The difference between the eigen values of factors 2,3, and 4 is not very large (the four -factor eigen-values are: 3.45, 1.96, 1.21, 1.10 respectively). The four factors are:

1. Interpersonal control, especially in group situations, consisting of 5 items: "easy to play an important part in most group situations" (V285); "get

others to help carrying on a plan of mine" (V292); "guiding the course of conversation with several others" (V300); "get my point of view across to others" (V302); disagree with "in attempt to smooth over a disagreement usually make it worse" (V303). This factor appears to be similar to Christie and Paulhus's interpersonal control construct. However unlike it, it shows mainly an ability to interact successfully and be influential, especially in group situations and not in all interpersonal situations.

2. The second factor consists of 2 items: "ability to make and keep friends" (V298); "can usually establish close personal relationship with someone I find attractive" (V301). While in the other three factors the way of dealing with the environment, either social or personal, is manipulating it and trying to control it, this factor seems to represent an alternative. It appears to be a construct of interaction and relationships rather than control and manipulation. Therefore, it might be interesting to investigate the effect this factor has in comparison with the other three factors.

3. The third factor consists of 2 items: "get what I want because I worked hard" (V284); "major accomplishments due to hard work and ability" (V290).

This factor appears to be similar to the original personal efficacy concept of Christie and Paulhus, the ability of the self to achieve and exert control over its nonsocial environment. However it focuses only on achievement through hard work, and not on making plans or on comparison with other people's achievements.

4. The fourth factor was achievement and social manipulation consisting of 5 items: "when make plans make them work" (V286); "learn almost anything I set my mind to" (V288); "can steer an interviewer towards topics" (V289); "if there is somebody I want to meet I can usually arrange it" (V293); disagree with "competition discourages excellence" (V294). This factor appears to focus on the ability of individuals to achieve or "get" what they want, either through goal oriented behavior or social manipulations. The factor seems to describe ambitious achievers who usually get their way. This factor seems to be typical to "Yuppies" (Young Urban Professionals), an emerging new group of people who are usually described as upwardly mobile, urbanites, materialistic and ambitious achievers (Piesman & Hartley, 1984; Carpini & Sigelman, 1986). Since the sample of this study consists mainly of middle-class, educated people who live in New York city, it seems reasonable that some of our respondents fit this description.

There are several relatively high correlations among the factors. The interpersonal control factor is correlated with the achievement factor (r=.37), and with the personal relationships factor (r=.40). The achievement factor also correlates with the hard work factor (r=.30) and the personal relationships factor (r=.32). There are very low correlations between the hard work factor and the interpersonal control factor and the personal relationships factor (r=.02 for both).

Table 4
The factor loading of the selected control items; 4 factors using oblique rotation (pattern matrix) (N=141)

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
V284	-0.015	.124	.712	.129
V285	.338	-0.100	-0.017	.183
V286	-0.052	.090	.091	.718
V288	.011	.008	.129	.493
V289	.095	-0.068	.240	.295
V290	.041	-0.123	.732	-0.003
V292	.398	-0.063	.114	.022
V293	-0.071	-0.105	-0.072	.530
V294	.135	-0.007	.001	.419
V298	-0.055	-1.039	.027	-0.062
V300	.360	-0.066	-0.233	.258
V301	.114	-0.456	.017	.156
V302	1.085	.196	.016	-0.077
V303	.437	-0.194	-0.036	-0.069

Each of the four factors was scaled by combining the scores of its items, and the reliability of the scales was estimated, using the SPSSX reliability program. The reliability of all scaled factors is quite high (as could

be expected from a factor analysis derived scales). The overall reliability of the interpersonal control scale (V285, V292, V300, V302, V303) is 0.67. If any of the items except V292 is dropped, the reliability of the scale is lower; dropping V292, "getting others to help", does not change the reliability. The overall reliability of the personal control, hard work scale (V284, V290) is 0.70. The overall reliability of the achievement scale (V286, V288, v289, V293, V294) is 0.66. If any of the items is dropped, the reliability of the scale is lower. The overall reliability of the personal relationships scale (V298, V301) is 0.69.

Table 5
Mean and standard deviation of men and women on the control scales

	personal efficacy	achievement	interpersonal control	personal relationship
men	7.79	18.38	19.22	7.20
n=107	(1.63)	(3.22)	(3.02)	(1.84)
women	7.77	19.77	20.15	7.56
n=34	(1.88)	(2.92)	(3.45)	(1.89)

Multivariate analysis of variance comparing the answers of men and women to these four scale show no significant differences (F(Wilks)=1.567, df=4, p=.187). One way analysis of variance show significant differences

only for the achievement (Yuppie) scale ($F(1,139)=4.948$, $p=.028$). Men have lower achievement scores than women (see table 5).

In conclusion, although the control constructs suggested by Christie and Paulhus do not fit our data, two of the factors found in the study seem to correspond, at least in part, to the original constructs. First the interpersonal control construct, although in the study it seems to include mostly group situations and not personal situations. Second, the personal efficacy construct, although in the study it includes only two items which focus on achievement through hard work. Another factor seems to focus on manipulation and "getting one's way" through both personal achievement and interpersonal skills. The last factor is not a control factor but suggests personal relationships as an alternative way of interacting with the one's social environment. In addition, it seems that both genders have about the same pattern of responses and therefor can be analysed together.

Analysis of Christie & Paulhus control subscales

It was decided to use in the present study the four scales which emerged in the factor analysis instead of the original 20 items of Christie and Paulhus (1981)

control scales. However, the decision to use the four factors found in the study might not be the right one, and could lead to the loss of valuable information, especially since the sample of the present study is not representative of the the general population, but consists of IBM personal computer users who are highly educated and mostly belong to upper-middle socioeconomic class. Therefore, the analyses conducted for the four scales were also done for the original two subscales--personal efficacy (10 items) and interpersonal control (10 items).

The estimated reliability of the personal efficacy subscale which consists of the original 10 items (V284, V286, V287, V288, V290, V291, V294, V295, V296, and V299) is 0.65. Several items which were dropped from the four scales also do not seem to be strongly related to the rest of the items in the scales: when V296 (like to know how well do relatively to others) is dropped, the reliability is raised to 0.66; when V295 (people get ahead just by being lucky) is dropped, the scale's reliability is 0.65; When either V287 (prefer games involving luck than games with pure skill) or V299 (pointless to keep working when it is too difficult) are dropped, the scale's reliability is 0.64. In further analyses all 10 original items of the personal efficacy

scale were included. The estimated reliability for the interpersonal control scale (items V285, V289, V292, V293, V297, V298, V300, V301, V302, and V303) is much higher (.75). When any of the items in this scale are dropped, the reliability is not changed much.

Factor Analyses of perceptions of computers

1. Reasons for not buying a computer.

Respondents were asked about the reasons that initially held them back from buying a computer. 10 items listed possible reasons and respondents rated each of them on a five-point scale. These items were factor analysed, using oblique rotation in order to find the underlying constructs for respondents' initial reluctance. The analysis shows that a three-factor model (χ^2(=18,N=141)=28.60, p=.054) fits the data significantly better than a two-factor model (χ^2(26,N=141)=56.34, p=.0005) or a four-factor model (χ^2(11,N=141)=20.01, p=.04, see table 6). However, there is a large discrepancy between the eigen values of the first and the second factors in comparison with the third factor (2.12, 2.42, 0.58 respectively).

Table 6
The factor loading of the barrier items; 3 factors, using oblique rotation (pattern matrix) (N=141)

	FACTOR 1	FACTOR 2	FACTOR 3
V82	-0.001	-0.032	.566
V83	.637	.116	.215
V84	.028	.480	.459
V85	.007	.589	-0.021
V86	.111	.773	-0.095
V87	.076	.551	.366
V88	.183	-0.123	.626
V89	-0.089	.223	.471
V90	.039	.168	.190
V91	1.022	.027	-0.093

The first factor is confidence about computers. It includes two items, fear that computers are too difficult (V83), and feeling of incompetence (V91). The second factor is confusion. It includes items such as not being sure which computer to buy (V84), not getting enough help from sales people (V85), not being sure which store to go to (V86), and need for more information (V87). Some of the items which load highly on the confusion factor also load, although not as highly, on the third factor - especially not being sure which computer to buy (V84). However, the item on the third factor focus only on the computer and not on items which indicate need form help as in the second factor. The hesitation in this factor seems to be related not to confusion about computers and need for help, but to wanting a computer on one hand, and

weighting its expense and the possibility that newer and better models would be produced in the near future on the other hand. The items which load highly only on this factor are: the computer is too expensive (V82), not sure they need it (V88), better wait for newer and better models (V89).

The correlations between the factors are 0.34 between the low confidence and the confusion factors; 0.37 between the low confidence and the weighting need and expense factors; 0.47 between the confusion and the weighting need and expense factors. Although the third factor does not explain much of the variance in the questions and it is correlated with the confusion factor, these factors seem to convey different meanings. One is confusion because of lack of knowledge about computers need for help, and the other is reluctance not because of confusion but because of expense, no urgent need for a computer and knowing that improved (and probably not much expensive) models are bound to appear. Therefore they were not combined into one scale but stayed separate.

Each of the three factors was scaled by combining the scores of its items, and the reliability of each scale was estimated. For the self confidence scale (V83, V91) the reliability is 0.85. Since the items on this scale are highly skewed (48.9% answers the first category

of the question about computers being too difficult (NO!), 61.7% do not feel incompetent), the items were dichotomized and their reliability was estimated again. The reliability of the scale using the dichotomized items was worse (r=.75), and therefore the scale in which the items are not changed were used. The reliability of the confusion scale (V84, V85, V86, V87) is 0.80; the reliability of the expense and need scale (V82, V88, V89) is lower (r=.60).

2. What the computer can do for you

Users were asked what they thought the computers could do for them. The question consists of 10 items ranging from NO! (1) to YES! (5) on a five-point scale. One item "help my children" (V121), was dropped because not all respondents have children. The factor analysis reveals either 2 or 3 factors. Although a three-factor model ($\chi^2(18, N=141)=26.94$, $p=0.08$) fits the data better than a two-factor model ($\chi^2(26, N=141)=44.82$, $p=0.012$; χ^2difference$(8, N=141)=17.88$, $p=.022$) the difference between two and three factors does not seem to be very meaningful.

In a two-factor model the factors are: First, a factor which seems to be related mainly to the computer as a helper in work and in general. It consists of 3

items: "make my life easier" (V112), "help with my work" (115), "make things more convenient" (V121). Second, a general improvement factor which consists of 7 items: "improve my mind" (v113), "be a lot of fun" (V114), "keep abreast with the modern world" (V116), "sense of accomplishment" (V117), "job opportunities" (V118), "social recognition" (V119), "improve knowledge of computers" (V120). The correlation between the two factors is 0.32. The difference between the two-factor model and the three-factor model is that in three factors one item, "improve my mind" (V113), becomes a factor by itself. However, this factor loads highly on the general improvement factor as well, even in oblique rotation (.75 by itself versus .49 in the general improvement factor). Therefore, a two-factor model is preferred over a three factor model. (See table 7 for factor loadings).

The two factors were scaled and the reliability of each was estimated. The reliability of the general improvement factor is 0.85. If any of the items is dropped, the reliability is lower. The reliability of the "help with work" scale is 0.61. When the item "help with my work" (V115) is dropped, the reliability is raised to 0.68. However, since this item is important for the meaning of the factor and dropping it would change

it, and since the difference in the reliability is not very large, this item was not omitted.

Table 7
The factor loading of the "what the computer can do" items; 2 factors using oblique rotation (N=141)

	FACTOR 1	FACTOR 2
V112	1.037	-0.149
V113	.133	.654
V114	.015	.537
V115	.251	.038
V116	-0.013	.845
V117	-0.153	.794
V118	.023	.656
V119	.053	.583
V120	.001	.632
V122	.513	.055

3. Images of the computer

Respondents were asked about their images of the computer on 12 separate adjectives. Factor analysis, using oblique rotation, shows that the fit of a four-factor model ($\chi^2(17, N=141)=16.767$, $p=.47$) is significantly better than a three-factor model ($\chi^2(25, N=141)=34.733$, $p=.09$; χ^2difference$(8, N=141)=16.966$, $p=.030$).

However, in the four-factor model three out of the four factors consist of only one item, and for two of the factors the eigen values are less than 1.00. One factor is a one item only factor (V230, "tool"). The other two factors consist of two items with very uneven factor

loadings. For one factor the items are "servant" (V228) and "toy" (V229) and the factor loadings are 0.73 and 0.33 respectively (the item V234 "thinker" also loads on this factor, however its loading is much higher for the first factor; .62 vs. -.35). For the other factor the items are "limited" (V227) and "predictable" (V232) and the factor loadings are 0.81 and -0.34, respectively (see table 8 for varimax the rotated factor loadings).

Table 8
The factor loading of the images items; 4 factors using varimax rotation (N=141)

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
V227	-0.128	-0.100	.817	.194
V228	.059	.108	.003	.722
V229	-0.013	-0.152	.273	.335
V230	.081	.975	.031	.201
V231	.764	.045	-0.254	.068
V232	.112	.019	-0.409	.040
V233	.272	.058	-0.003	.044
V234	.619	-0.081	.070	-0.352
V235	-0.030	-0.351	.227	.129
V236	.658	.035	-0.249	.170
V283	.433	.002	-0.110	-0.290

Therefore, since three out of the four factors basically consist of only one item, and the three-factor model fits the data (although not as well as the four-factor model) and only one factor has an eigen value of less than 1.00, it seems reasonable to use the three-factor model instead of the four-factor one (see table 9

for factor loadings). The first image in the three-factor model is personification - seeing the computer as a person: a "friend" (V231), a "partner" (V236), a "thinker" (V234), an entity "similar to people" (V283). The second factor consists of only one item, "servant" (V228). (The item "tool" (V230) has relatively high loading on this factor but there is a large discrepancy between the factors loadings of the two items, 0.79 for V228, 0.35 for V230). Since the image of servant is an interesting one and was not captured by the other two factors, this factor is used in further analyses although it consists of only one item. The third factor consists of four items: "limited" (V227), "toy" (V229), "predictable" (V232), and "useless" (V235) (factor loadings .70, .43, -.38, .39, respectively). This factor seems to convey disappointment, disapproval and a wish to "belittle" the computer by seeing it as unreliable and useless and therefore as less threatening.

The only reasonably high correlation between the factors is between the personification and the limited factors (r=-0.20). There are very small correlations between the rest of the factors.

Scales were developed from the two factors which consist of more than one item, and the reliability of each was estimated. The reliability of the

personification scale (V231 V234 V236 V283) is quite high (r=0.71). The reliability of the third factor which consisted of the 4 items "limited", "toy", "unpredictable", and "useless" is 0.53, and if the item "toy" (V229) is dropped it is 0.54. Since 81.6% answered the first category (NO!) for the "useless" item, these item as well as all the other items in the scale were dichotomized. The reliability of the dichotomized scale is 0.54, and if V229 if dropped it is raised to 0.59.

Table 9
The factor loading of the images items; 3 factors using oblique rotation (pattern matrix) (N=141)

	FACTOR 1	FACTOR 2	FACTOR 3
V227	-0.106	.018	.704
V228	.047	.785	.184
V229	.035	.192	.430
V230	.007	.347	-0.151
V231	.758	.129	-0.146
V232	.077	.136	-0.384
V233	.291	.050	.077
V234	.624	-0.325	.058
V235	.039	-0.051	.395
V236	.645	.225	-0.122
V283	.421	-0.219	-0.156

4. Feelings while working on the computer

Respondents were presented with 13 items which asked what they feel while working on the computers. The semantic differential, which presents opposite adjectives for each item, was used in this question. The

distribution of the answers on these items seems to fit a 3 point scale and not a five point scale as was presented in the study, because there were very few who answered the extreme negative adjectives. Therefore, a factor analysis was run using the items collapsed into 3 point scales. Two models fit the data using oblique rotation: a four-factor model ($\chi^2(32, N=141)=43.867$, $p=.079$), and a five-factor model ($\chi^2(23, N=141)=27.421$, $p=.24$; χ^2difference$(9, N=141)=16.446$, $p=.058$)

Table 10
The factor loading of the feelings items; 4 factors using oblique rotation (pattern matrix) (N=141)

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
V254	.100	.072	.064	.897
V255	-0.338	.160	.096	.507
V256	1.039	-0.016	-0.092	.003
V257	.418	-0.192	.241	.012
V258	.067	.491	-0.291	.023
V259	-0.101	-0.024	-0.258	.521
V260	.133	-0.045	.733	.035
V261	.302	-0.006	.422	-0.273
V262	-0.061	.080	-0.384	.203
V263	.052	-0.157	-0.007	-0.133
V264	-0.039	.874	.181	.060
V265	.487	.061	.271	-0.049
V266	-0.077	.367	-0.202	.070

The four factors are (see table 10 for factor loadings): The first factor, consists of 3 items, "competent-incompetent" (V256), "independent-dependent" (V257), and "in control-helpless" (V265). The second

factor, consists of 3 items: "high-depressed" (V258), "human-dehumanized" (V266), and "challenged-bored" (V264). The third factor associates being satisfied and relaxed with rationality. It consists of 3 items: "relaxed-anxious" (V260), "satisfied-frustrated" (V261), "rational-emotional" (V262). The fourth factor, consists of 3 items: "ambitious-lazy" (V254), "imaginative-dull" (V255), "productive-unproductive" (V259).

All factors are highly correlated especially the "challenge" and the "productivity" factors ($\underline{r}$=0.62), the "in control" and the "rational" factors ($\underline{r}$=0.51), and the "in control" and "productive" factors ($\underline{r}$=0.49). The rest of the correlations are between the "in control" and "challenged" factors ($\underline{r}$=0.34), the "rational" and the "challenged" factors ($\underline{r}$=0.31), and the "rational" and the "productive" factors ($\underline{r}$=0.33).

There seem to be several problems with a four factor solution. It is hard to see them as distinctively separate constructs. They all seem to convey the same general meaning of either positive or negative feelings while using the computer. In addition, the eigen-value of the first factor is 5.360, and explains 41% of the variance, while the eigen-value of the second factor is only 1.43, the third is 1.01, and the fourth is 0.897. It appears that the feeling items might have one

important component which explains a large portion of the variance, while the contribution of other components is very small. Therefore, although a one-factor model does not fit the data, it seems reasonable to construct one scale out of all related items and compare it with the four factors. This scale was constructed out of the items which load highly on the first factor when a principal component analysis is used.

All items, except V263 "playful-serious", load highly on the first factor (loadings for all items is at least .55, loadings for V263 is .31). The reliability of a scale which consists of all the feelings items, (except V263) is 0.825; if V258 "high-depressed" is dropped the reliability of the scale is raised to 0.87. The reliabilities of each of the scales which were developed from each factor are lower. For the "in control" scale $\underline{r}$=0.76; for the "rational" scale $\underline{r}$=0.73 (if V262 "rational-emotional" is dropped the reliability remains the same); for the "productive" scale $\underline{r}$=0.79; and for "challenged" scale $\underline{r}$=0.66. Therefore, only one scale of feeling while using the computer "positive-negative" was used in further analysis.

5. Areas of interests

The respondents were asked about their interest in various of areas concerning computers. Nine items which asked about interests in programming, hardware, and theoretical issues were included in a factor analysis using oblique rotation. Three factors fit the data well ($\chi^2(12, N=141)=13.16$, $p=.36$; eigen-values 3.79, 1.87, .86). The first factor is programming: applications (V268), and high level computer language (V269). The second factor is knowledge about computers: assembler language (V270), computer science (V271), logic and math of computers (V272), artificial intelligence (V273), solid state electronics (V274). The third factor is interest in computer hardware; knowing how computer hardware works (V275), and knowing how to make simple repairs (V276). (See table 11 for factor loadings).

Table 11
The factor loading of the areas of interests items; 3 factors using oblique rotation (pattern matrix) (N=141)

	FACTOR 1	FACTOR 2	FACTOR 3
V268	.940	.034	.110
V269	.558	.357	.101
V270	.206	.761	-0.087
V271	-0.037	1.015	-0.100
V272	.226	.711	.059
V273	.089	.661	.088
V274	-0.190	.624	.308
V275	.081	.124	.649
V276	.043	-0.075	.862

All factors are relatively highly correlated. The programming factor correlates highly with both the general interest factor (r=0.54), and the hardware interest factor (r=0.27). The correlation between the general interest factor and the hardware interest factor is 0.51.

The factors were scaled and the reliability of each was estimated. The reliabilities of all scales are quite good. The general knowledge scale reliability is 0.90; the hardware interest scale reliability is 0.76; the reliability of the interest in high level language and application scale is 0.89.

6. Style of Programming

The respondents were asked if they agree with three statements regarding programming style: "it is important actually to try things on the computer rather than read the manual" (V277), "Improvising is an essential part of working with computers" (V279), "I always try to document what I do on the computer" (V282). The questions in these three items were an attempt to tap two opposing styles of work on computers. One is hackers who are supposed to improvise try things out and hardly document their work, the other is structured programmers who are supposed to document their work and not improvise much.

It seems however, that the attempt to tap these styles did not succeed.

The correlations between the items indicates that while the first two items are somewhat related (r=.374), there are hardly any relationships between these items and the third item (r=-.023 and -.083, respectively). The reliability of a scale which consists of the first two items (V277 and V279) is 0.54, if the third item (V282) is added the reliability drops to 0.37. It might be the case that these styles are relevant only for experienced programmers, and not for the present sample in which only about half of the sample knows how to program (52.5%), and about third (36.9%) are advanced users.

PERCEPTIONS, UNDERSTANDING AND CONTROL

Subjective relations with the computer are one of the most important issues in this study. It was hypothesized that respondents with high personal efficacy would have positive feelings while working on the computer, and positive images of the computer, and would want to understand the way the computer operates as much as possible, while respondents with low personal efficacy would feel frustrated and dependent, would have negative

images of the computer and would not know much about the way the computer operates. It was also hypothesized that people with low interpersonal control skills would be more absorbed in the computer and would have more understanding of the way it works than people with high interpersonal control.

Although the control constructs suggested by Christie and Paulhus do not fit our data, two of the control factors found in our analysis seem to correspond partially to the original concepts of interpersonal control and personal efficacy. Another factor seems to be be a mixture of both personal achievement and interpersonal skills which is used for "getting one's way". The last factor presents an alternative way of dealing with one's environment which is not through control but through personal relationships.

The analysis of these relations consists of three parts: First, the interrelations between the relations to the computer variables: the images, feelings and understanding. Second, the relations between the control constructs as predictors and the perceptions of the computer as dependent variables. Third, the relations between the control constructs as predictors and the understanding variables as dependent variables.

1. Perceptions (feelings and images) and understanding

The correlations between the variables were used since there is no assumed direction to the relations between the feelings and the images constructs. (The correlations among the factors before being scaled were reported in the section about the factor analyses). There is a negative correlation between the person and the limited factor (r=-.261), and small correlations between the servant factor with the other two images factors (r=-.036 with "person" and r=.033 with "limited"). When the computer is perceived as a person and a friend it is not perceived as limited and useless. There are low correlations between the "servant" image and the other images. Maybe "servant" has different meanings for different users. Some might perceive it as a "good" servant which "obeys" their orders and is useful to have around. Others might see it as a "bad" servant which does not "do" what they expect, and makes them feel it is unreliable and useless. The "person" image correlates highly with the "positive" scale (r=.32). The "limited" scale has a high negative correlation with the "positive" scale (r=-.38). The image of servant has a very small correlation with positive feelings.

The results show that an image of a friendly person is related to good feelings while using the computer. An

image of a limited and useless entity is related to feelings of helplessness, and frustration. It seems that the perception of the computer as a limited entity is related to problems using the computer because users who feel incompetent dependent and anxious are those who see the computer as useless.

The correlations between the images, the feelings, and the understanding scales are (see table 12): The limited image correlates negatively with the general interest scale, the interest in programming applications and high level languages scale, and the wanting to know as much as possible item (V267). The correlation of interest in hardware variable with the limited image is relatively small. People who are not interested in the way the computer operates and want to know as little as possible see the computer as a limited and useless entity. Opposite relations are found between the personification of the computer, positive feelings and the understanding variables. Users who have an image of a person are interested in the way it works, in programming it, and want to know about it as much as possible.

The relations of positive feelings with the interest variable are not very different from those of the personification scale. The correlation with the

general interest factor is lower than this of the personification scale, and the correlation with the hardware interest factor is higher than this of the personification scale. The servant image does not have high correlations with any of the understanding scales. There are negative, although not significant relations, between wanting to know as much as possible and the servant image. More people who want to know as much as possible than people who want to know only what they need do not perceive the computer as a servant.

Table 12
The correlations between the feelings, images, and understanding scales (N=141)

	hardware	general interest	programming	want to know(v267)
positive	.188 p=.013	.226 p=.003	.288 p=.000	.257 p=.001
limited	-0.134 p=.057	-0.260 p=.001	-0.267 p=.001	-0.203 p=.008
person	.103 p=.112	.312 p<.001	.313 p=.006	.254 p=.001
servant	.077 p=.182	.021 p=.404	.025 p=.382	-0.121 p=.077

2. Control and Perceptions (Feelings and images)

The effects of the four control scales (hard work, achievement, interpersonal control, and personal

relationships) on the feelings (general positive) and images (personification, limited, and servant) were analyzed using the SPSSX regression procedure. The results are reported separately for each of the dependent variables (see table 13).

The most important predictor for the feelings scale is the personal efficacy scale ($\underline{B}$=.404, $\underline{r}$=.41). As was hypothesized, people who perceive their accomplishments as a result of their own doing feel more positive, in control and challenged while working on the computer than those with low personal efficacy. The effects of the achievement scale, the interpersonal control, and the personal relations scale positive feelings, when personal efficacy is taken into account are not strong ($\underline{B}$=0.002, 0.058, 0.049, respectively). When individual correlations are examined, the only other scale which has relatively strong relations with the feelings scale is the achievement scale ($\underline{r}$=.17). However this scale correlates with the personal efficacy scales which seems to cancel its influence out. Neither the interpersonal control nor personal relationships seem to be strongly related to this construct ($\underline{r}$=.097, .094 respectively).

Table 13
The control scales as predictors of the feelings and images of the computer (N=141)

1. dependent variable positive feelings

independent	b	B	F	SigF	r
achievement	.003	.002	.000	.983	.173
work	1.369	.404	23.712	.000	.410
interpersonal	.105	.058	.438	.501	.097
personal relat.	.152	.049	.326	.569	.094

MultR=.420 Rsq=.176 AdjRsq=.152 F=7.279 SigF=.000

2. dependent variable personification

independent	b	B	F	SigF	r
achievement	.181	.172	3.263	.073	.239
work	.222	.111	1.594	.201	.174
interpersonal	.105	.058	.438	.501	.111
personal relat.	.152	.049	.326	.569	.145

MultR=.272 Rsq=.074 AdjRsq=.047 F=2.721 SigF=.032

3. dependent variable limited image

independent	b	B	F	SigF	r
achievement	-.048	-.151	2.629	.107	-.250
work	-.109	-.182	4.460	.037	-.237
interpersonal	-.048	-.178	3.851	.052	-.208
personal relat.	.040	.074	.673	.413	-.052

MultR=.338 Rsq=.114 AdjRsq=.088 F=4.375 SigF=.002

4. dependent variable servant image

independent	b	B	F	SigF	r
achievement	.022	.058	.365	.547	.047
work	-.016	-.023	.069	.793	-.006
interpersonal	.073	.194	4.280	.040	.124
personal rela-	-.143	-.224	5.832	.017	-.130

MultR=.237 Rsq=.056 AdjRsq=.028 F=2.018 SigF=.095

The relations between the images of the computer and the control constructs show somewhat different patterns but still confirm the original hypotheses. All constructs are positively related to the personification of the computer. Achievement is the scale most strongly related to the image of the computer as a person and friend (B=.172, r=.24). The second important variable, though its effect is not significant when the effect of the achievement scale is taken into account, is personal efficacy (B=.111). The personal relationships scale and the interpersonal control scale are not strongly related to personification either in a multiple regression (B=0.081, 0.016, respectively) or when individually correlated (r=0.145, 0.111, respectively).

All control constructs, except the personal relationship one, are strongly and negatively related to the image of the computer as a limited, useless and unpredictable entity. When individual correlations are examined, the relations between the achievement, the personal efficacy, the interpersonal control scales and the limited image are quite strong and about the same (r=.25, r=.237, r=.208, respectively). In multiple regression, the B weights of the personal efficacy scale and interpersonal relations are about the same and significant (B=-.182, -.178, respectively). The

achievement scale is not as significant (p=.10), but still quite meaningful (B=-.151). The personal relationships scale does not seem to be important in explaining the variance in the limited scale.

The image of the computer as a servant is related to the personal relationships and the interpersonal control scales. There are positive relations between the personal relationships and the servant scale (B=.194) and negative relations between the interpersonal control scale and the servant image (B=-.224). When their individual correlations are examined these relations are not strong (r=-.130, 0.124, respectively). The achievement and personal efficacy scales are hardly related to the servant image.

3. The control and the understanding scales

The relations between the control scales (achievement, personal efficacy, interpersonal control, and personal relations) as predictors, and the understanding variables (interest in hardware, general interest, interest in programming, and how much want to know (V267)) as the dependent variables was analysed using the SPSSX multiple regression program.

Table 14
The control scales as predictors of the understanding things about the computer (N=141)

1. dependent variable how much want to know

independent	b	B	F	SigF	r
achievement	.018	.042	.182	.670	.028
work	.079	.098	1.169	.282	.104
interpersonal-	.019	-.066	.202	.654	-.066
personal rela-	.079	-.106	1.264	.263	-.105

MultR=.159 Rsq=.025 AdjRsq=-.003 F=.883 SigF=.476

2. dependent variable interest in hardware

independent	b	B	F	SigF	r
achievement	.002	.003	.001	.972	.023
work	.129	.094	1.103	.295	.092
interpersonal	.099	.134	1.998	.160	.065
personal rela-	.235	-.187	8.395	.047	-.128

MultR=.203 Rsq=.041 AdjRsq=.013 F=1.465 SigF=.216

3. dependent variable general interest

independent	b	B	F	SigF	r
achievement	.225	.134	1.926	.168	.168
work	.383	.120	1.812	.180	.164
interpersonal	.106	.062	.435	.511	.077
personal rela-	.258	-.089	.136	.341	-.017

MultR=.220 Rsq=.049 AdjRsq=.021 F=1.733 SigF=.146

4. dependent variable interest in programming

independent	b	B	F	SigF	r
achievement	.180	.186	3.655	.058	.175
work	.029	.016	.031	.862	.076
interpersonal	.007	.007	.005	.942	.046
personal rela-	.100	-.060	.405	.526	.0003

MultR=.185 Rsq=.034 AdjRsq=.006 F=1.198 SigF=.315

The hypotheses about the relations between the interpersonal control construct and understanding how the computer operates were not confirmed in the results (see table 14). None of the scales explain much of the variance of the amount of knowledge that people want to have about the computer (V267). Interpersonal control does not seem to be an important predictor in any of the interest variables, interest in hardware, interest in programming, and general interest.

The original Paulhus & Christie's control scales and relation to the computer

The first analysis done is multiple regression analysis using the control scales as predictors of the relations to the computer. The results are similar to those obtained by the four scales. The achievement scale is the variable most strongly related to the interest in programming and high level languages scales ($\underline{B}$=185, $\underline{r}$=.17). None of the other control scales seem to be an important predictor of the interest in programming, even when their individual regressions are examines. The personal relationships variable is the predictor most strongly related to the interest in hardware ($\underline{B}$=-.186, $\underline{r}$=-.128). People who maintain warm personal relationships are less interested in hardware than people

whose personal relationships are less warm.

Table 15
The original control scales as predictors of the feelings and images of the computer (N=141)

1. dependent variable positive feelings

independent	b	B	F	SigF	r
personal efficacy	.397	.380	21.345	.000	.374
interpersonal con-	-.021	-.021	.068	.794	.085

MultR=.374 Rsq=.140 AdjRsq=.128 F=11.245 SigF=.000

2. dependent variable personification

independent	b	B	F	SigF	r
personal efficacy	.107	.159	3.379	.068	.190
interpersonal cont.	.071	.115	1.765	.186	.159

MultR=.221 Rsq=.049 AdjRsq=.035 F=3.528 SigF=.032

3. dependent variable limited image

independent	b	B	F	SigF	r
personal efficacy-	.067	-.332	16.074	.0001	-.352
interpersonal con-	.014	-.075	.814	.368	-.167

MultR=.360 Rsq=.129 AdjRsq=.117 F=10.251 SigF=.000

4. dependent variable servant image

independent	b	B	F	SigF	r
personal efficacy	.007	.031	.124	.679	.041
interpersonal cont.	.008	.037	.172	.679	.045

MultR=.054 Rsq=003 AdjRsq=-.012 F=.205 SigF=.815

None of the other control scales is strongly related to interest in hardware. As for the general interest in how the computer operates, when the effects of all

control scales is taken into account, none of the B weights is significant. However, there seem to be relatively strong relations between this scale and the personal efficacy and the achievement scales. The B weights (B=0.120, 0.134, respectively) and the individual correlations (r=0.163, 0.168, respectively) of these scales are much higher than the other two control scales.

People who had high scores on the personal efficacy scales reported positive feelings while using the computer, did not see the computer as a limited and useless entity, and personified it. The interpersonal control scale was related, but less strongly than the personal efficacy scale, to NOT seeing the computer as limited and to the "person" image; it is hardly related to the feelings scale. Both scales are barely related to the "servant" image (see table 15).

The relations between the original control scales and the understanding scales were somewhat different. When four scales were used, the interest in hardware was only significantly related (r=-.13) to the personal relations scale, and there were no significant relations between any of the control scales and the item asking how much users want to know was not. When the two original control scales were used, interest in hardware, and wanting to know as much as possible about how the

computer operates were significantly related to the personal efficacy scale (r=.13, .14, respectively).

Table 16
The original control scales as predictors of the understanding the computer scales (N=141)

1. dependent variable how much want to know

independent	b	B	F	SigF	r
personal efficacy	.044	.162	3.434	.066	.127
interpersonal con-	-.031	-.124	2.017	.158	-.080

MultR=.420 Rsq=.176 AdjRsq=.152 F=7.279 SigF=.000

2. dependent variable interest in hardware

independent	b	B	F	SigF	r
personal efficacy	.067	.144	2.695	.103	.140
interpersonal con-	-.006	-.015	.030	.863	.025

MultR=.141 Rsq=.020 AdjRsq=.006 F=1.392 SigF=.252

3. dependent variable general interest

independent	b	B	F	SigF	r
personal efficacy	.222	.206	5.666	.019	.214
interpersonal cont.	.026	.027	.094	.760	.084

MultR=.215 Rsq=.046 AdjRsq=.032 F=3.344 SigF=.038

4. dependent variable interest in programming

independent	b	B	F	SigF	r
personal efficacy	.112	.180	4.325	.039	.189
interpersonal cont.	.015	.027	.096	.757	.078

MultR=.190 Rsq=.036 AdjRsq=.022 F=2.592 SigF=.079

In addition, the two other understanding scales, general interest and interest in programming, were also

significantly related to the personal efficacy scale (r=.21, .19, respectively). There were no significant relationships between any of the understanding scales and the interpersonal control scale (see table 16).

GENERAL TYPES OF COMPUTER USERS

One of the main goals of this study is to identify general types of computer users based on what they do with their computers. Users were classified according to their uses of the computer using the SPSSX cluster program. The items included in the cluster analysis are only those in which the users describe their activities, and rate their computer expertise, and degree of involvement. Items which describe attitudes or interests were not included because they are not part of a computer use typology but are to be explained by the users types.

1. In search of hackers

As was discussed in the introduction, the literature about computer users focuses on the hacker types. Hacker are described as people who are addicted to working on the computer, who like to improvise, whose work is not systematic but is largely based on trial and error, and who seldom document what they do (Turkle,

1980, 1982, Levy, 1984, Weizenbaum, 1975). It is usually argued that the main motive of users to "hack" is the controllability and predictability of the computer in contrast to the behavior of human beings. Hackers are described as people who are frustrated by their lack of ability to have control their interpersonal relations and therefore prefer relating to computers. It was hoped that hackers would be one of the types of computer users found in the study.

The main variable examined was a direct question "do you consider yourself a hacker" (V226). (Respondents answers were yes, no and "don't even know what the hell it means"). Only 23 respondents (16.3%) describe themselves as hacker (see table 17). Table 17 also shows that 3 out of the 7 people who rated their computer expertise as beginners also describe themselves as hackers (and one computer novice).

It is possible that although respondents could answer that they do not know what "hacker" means, the beginner who said they are hackers did not know what it means. Unfortunately it is not clear whether this was the case, and if so, whether some of the more advanced users who said they are hacker (more intermediate users than advanced ones said they are hackers) did not misunderstand the concept as well. Since we can not know

whether the beginners and novices knew what "hacker" means, but the concept itself is very important in the "search" for hackers, further analyses which included this variable were done twice. Once with the original "hacker" variable and once with the beginners and the novices dropped as hacker and moved to the none hacker category.

Table 17
Percent of computer expertise by self-description as a "hacker" (no and don't know collapsed together)

	HACKER			
EXPERTISE	No	Yes	TOTAL %	N
complete beginner	57	42	100%	(7)
novice	97	3	100%	(30)
intermediate user	85	15	100%	(52)
advanced user	88	12	100%	(33)
computer pro	63	37	100%	(19)
TOTAL %	84	16		
TOTAL N	(118)	(23)		(141)

The main construct presented in the literature which describes hackers is their work style. However (as was discussed above), the three variables which focus on work style do not seem to be strongly related to each other.

Further examination of the work style variables and their relations to the computer expertise variable (V225) and the hacker variable (V226) show that each one of the style of work items relates differently to these variables. Trying out things rather than using the manuals (V277) is not related to either hacking ($\chi^2(4,N=141)=.520$, $p=.972$ for original variable; $\chi^2(4,N=141)=1.946$, $p=.746$ for the changed variable) or computer expertise ($\chi^2(8,N=141)=5.553$, $p=.697$). Improvisation while working on the computer (V279) is related to expertise ($\chi^2(8,N=141)=19.815$, $p=.011$), the more advanced the user is the more they improvise. It is not related to hacking ($\chi^2(4,N=141)=1.867$, $p=.760$ for the original variable; $\chi^2(4,N=141)=6.441$, $p=.169$ for the changed variable). Documenting the work (V282) is not related to expertise ($\chi^2(8,N=141)=7.325$, $p=.502$), but seems to be related to hacking ($\chi^2(4,N=141)=7.980$, $p=.092$ for the original variable; $\chi^2(4,N=141)=9.067$, $p=.060$ for the changed variable), hackers seem to document less.

Another variable which is supposed to be related to hacking is the amount of time spent on the computer. It was argued that hackers are addicted to work on the computer and spent much more time using it than any other users. However, in the present study, the amount of time spent on the computer (V166) seem to be related only to

computer to expertise ($\chi^2(6,N=141)=16.835$, $p=.001$), and not to hacking ($\chi^2(3,N=141)=1.601$, $p=.786$ for the original variable; $\chi^2(3,N=141)=.626$, $p=.891$ for the changed variable).

2. General types of users, based mainly on behavior

In the initial cluster analysis items which were described in the literature as identifying hackers were included. Amount of time working V166, documenting one's work V282, the trying out and improvising scale v277+v279 (or improvisation 279 by itself). In addition the activities and expertise variables described below were included. However, none of the resulting clusters seem to provide coherent and interpretable computer types. These results are not surprising in light of the "in search of hackers" described above.

Thus only the following items were used: First, items which listed possible uses for the computer on a five-point scale ranging from NO! (1) to YES! (5). The listed uses are: finance (V95), banking (V96), communication with other users (V97), word processor (V98), writing programs (V99), games (V101), tracking investments (V102), accounting (V103), mathematical and scientific work (V104), graphics and art (V105), accessing data bases (V106), keeping records and managing

information (V107), learning programming (V108). (The item which asked about using the computer for the children (V100) was dropped, because not all respondents have children). The rest of the items are: Users' ability to program (V209, dichotomous 1 yes, 2 no); do the users describe themselves as hackers (V226, dichotomous 1 yes, 2 no); computer expertise (V225, 5 categories), and the number of computer magazines read (ranging from 0 to 5).

The self-description as hackers variable was included even though at least some of the beginners did not know what it means, because it was important in identifying different clusters of experienced users. It is reasonable to assume that although some of the beginners who rated themselves as hackers did not knew what the concept meant, the experienced users who are more involved with computers who rated themselves as hackers, actually knew what it means. This assumption is strengthened by the fact that when the same cluster analyses were run twice, once with the original hacker variable and once with the changed variable (excluding beginners and novices), the clusters were exactly the same.

Five clusters appear to be provide the most reasonable typology of the respondents (see table 18).

All respondents use the computer for word processing and record keeping. They are differentiated by the rest of their activities. The first cluster includes "experienced" group of users who are knowledgeable about computers, but not real experts (n=36). They do most activities, especially the financial ones, and their scores are above average for most other activities, although not very high. They use the computer for accounting, tracking investments, finance, games, math and science, and for programming. Their scores are low on banking and communications. Not all of the respondents know how to program, they are more than intermediate computer users (3.44), do not consider themselves hackers and read an average of 1.92 of computer magazines. Examination of the occupations of the respondents in this group show that more than a half (58.4%) hold managerial or consulting positions (usually in the fields of computers or finance), and few are college professors (four of them did not specify the field, 19.4%).

The second type includes "very involved" group of users who seem to be very experienced and enthusiastic (n=23). (Are they computer hackers? The concept appear to be too vague to be used). They use the computer for most activities, especially communication, data bases,

and programming, almost all of them can program, they are extremely knowledgeable users (4.13), read an average of 3.17 computer magazines, and many consider themselves hackers. Examination of the occupations of the respondents it this group show that most of them are computer specialists who deal with both technical aspects of computers and software (73.9%), and three are social science professors.

The third cluster appears to consist of users who are not very experienced but are still interested in using the computer, especially for financial activities (n=25) ("inexperienced enthusiasts"). They have high scores on finance and accounting, they also use data bases. Many do not know how to program (1.68), they are less than intermediate users (2.88), and they read an average of 2.04 computer magazines. Examination of the occupations of respondents in this group show that about half have managerial positions in various fields, from music director to traffic manager (52%).

The fourth cluster consists of users who use computers mainly for programming and scientific work and, to a lesser extent, graphics and data bases (n=32) ("math and science"). They have very low scores on all financial activities. About half know how to program, they are intermediate users (3.09), and they read an

average of 1.47 computer magazines. The vast majority of the respondents in this group are college professors (87.5%) most of them in the social science or exact sciences fields.

Table 18
Types of computer users, 5 clusters (N=141)

	experienced type1		very involved type2		inexperienced enthusiasts type 3		math and science type 4		least involved type 5	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
financ	3.78	1.01	3.72	.92	3.96	1.02	1.78	.55	2.04	1.06
bankin	2.64	1.15	3.13	1.10	2.20	1.08	1.69	.82	1.44	.82
commun	2.92	1.16	4.13	.87	2.69	1.26	2.78	1.21	1.36	.70
wordpr	4.61	.55	4.61	.58	4.64	.57	4.89	.34	4.68	1.11
progra	3.86	1.10	4.26	.86	2.24	.93	3.75	1.34	1.56	1.04
games	3.17	1.21	2.57	1.12	1.76	.83	1.75	.76	1.84	1.18
invest	3.44	1.18	2.39	1.20	2.96	1.54	1.47	.51	1.20	.50
accoun	4.22	.72	3.52	1.16	3.88	1.27	2.25	1.24	1.64	1.08
math/s	3.58	1.32	3.17	1.15	1.68	.85	3.94	1.41	1.56	1.00
graphi	3.25	1.36	3.44	1.12	1.96	.89	3.41	.84	1.28	.54
databa	3.50	1.08	4.13	.87	3.44	1.08	3.09	1.23	2.00	1.32
keep r	4.36	.64	4.48	.59	4.12	.83	3.94	.98	3.04	1.54
learn	3.56	1.30	3.26	1.34	2.12	.97	2.56	1.19	1.60	.91
V209	1.42	.50	1.13	.34	1.68	.48	1.44	.50	1.88	.33
hacker	1.89	.32	1.61	.50	1.80	.41	1.91	.30	1.92	.27
expert	3.44	1.05	4.13	.87	2.88	.88	3.09	1.06	2.40	.71
magazi	1.92	1.25	3.17	.83	2.04	1.62	1.47	1.50	.56	.92
N	36		23		25		32		25	
%	25.5		16.3		17.7		22.7		17.7	

The fifth type includes the "least involved" group of users who are interested only in word processing (n=25). They do not know how to program, rate themselves as beginners (2.4), most of them do not read regularly any computer magazines (0.56 average). The vast majority of

respondents in this group hold positions in humanities such as writing, history, psychotherapy, English or acting. Of the rest, two are social scientists and one is a retired computer specialist.

Table 19
The five types and initial sampling sources

COUNT / ROW PCT / COL PCT	SAMPLING SOURCES					ROW TOTAL
TYPES	Mailing list	Faculty	IBM user group	Computer store	Snow ball	
Experienced	9 25.0 47.4	7 19.4 17.9	7 19.4 23.3	9 25.0 29.0	4 11.1 22.7	36 25.5
Very involved	5 21.7 26.3	4 17.4 10.3	7 30.4 23.3	2 8.7 6.5	5 21.7 22.7	23 16.3
In-experienced enthusiasts	4 16.0 21.1	2 8.0 5.1	10 40.0 33.3	6 24.0 19.4	3 12.0 13.6	25 17.7
Math and science	1 3.1 5.3	18 56.3 46.2	4 12.5 13.3	5 12.5 12.9	5 15.6 22.7	32 22.7
Least involved	8 32.0 20.5	2 8.0 6.7	10 40.0 32.3	5 20.0 22.7	25 17.7	
COLUMN TOTAL	19 13.5	39 27.7	30 21.3	31 22.0	22 15.6	141 100.0

The relations among the five users types and the different sources of sampling (computer store, mailing list, IBM user group, faculty, and snowball) were examined in order to see whether the types found are a close replication of the original samples. The results

show that although there is some correspondence between the two variables, they are not the same (see table 19).

It is encouraging that the snowball respondents are about equally distributed among the groups. As could have been expected, a large percentage of type four are faculty members (56.3%), and more respondents from the mailing list and the users group are experienced users while many of the respondents from the computer store who were only recent buyers belong to the fifth group of the least experienced users.

The Five Types and Personality Related Variables

1. The five types and the control scales

A multivariate analysis of variance did not show significant relations between the four control scales and the five users types (MANOVA, F=1.41, df=16, p=.13). There are also no significant differences when the relations of each control scale are analysed separately in a univariate (oneway) analysis (for descriptive statistics see table 20).

Table 20
Means and standard deviations of the five types on the control scales

	TYPES				
	experienced	Very involved	In-experienced enthusiasts	Math and science	Least involved
personal efficacy	8.06 (1.59)	8.17 (1.59)	7.68 (1.80)	7.25 (1.76)	7.84 (1.65)
achievemt	8.89 (3.40)	19.61 (2.62)	19.36 (2.41)	18.09 (3.31)	17.80 (3.74)
interpers control	19.31 (3.06)	19.70 (2.84)	18.72 (3.17)	19.22 (3.43)	20.40 (3.10)
personal relations	7.69 (1.79)	7.13 (1.69)	7.28 (1.86)	7.13 (1.74)	7.04 (2.23)

Furthermore, no significant differences were found between the types when the original control scales were used. Both MANOVA (the two control scales were included simultaneously), and oneway analysis of variance were conducted. The results are similar to those obtained by the four scales; no significant differences were found among the groups (see table 21). For the MANOVA, F(Wilks)=.940, df=8, p=.484. For the oneway analysis of variance, the results for the personal efficacy scale are: $F(4,136)=1.525$, p=.198; for the interpersonal control scales the results are $F(4,136)=.347$, p=.846

Table 21
Means and standard deviations of the five types on the original control scales (N=141)

	TYPES				
	experienced	Very involved	In-experienced enthusiasts	Math and science	Least involved
personal efficacy	37.33 (4.85)	39.30 (4.35)	38.44 (4.38)	36.38 (5.73)	36.80 (4.88)
interper-sonal con	37.50 (5.42)	37.96 (5.17)	36.56 (5.33)	36.69 (5.88)	37.27 (5.68)

2. The five types and relations to the computer

A. perceptions and feelings

There are significant differences between the five users types on the images (person, limited, servant) and feelings scales using MANOVA (F(Wilks)=2.836, df=16, p=.000). One way analyses of variance show that the five groups differ significantly on two out of the four variables, the image of a person ($F(4,136)=8.684$, $p<.001$) and the image of a limited and unpredictable entity ($F(4,136)=3.368$, $p=.012$). (See table 22).

A posteriori statistical analyses (Duncan procedure, $p=.05$) show: On the personification scale the first four groups had significantly higher scores than the fifth group of the "least involved" users. In addition, the "experienced" group in which the users are quite

knowledgeable (second after the "very involved" group) and in which most hold jobs as consultants has significantly higher scores on the personification image than the fourth group which consist of users who are mostly faculty members and use the computer for mathematic and scientific work.

Table 22
Means and standard deviations of the five types on the feelings and images scales

	TYPES				
	experienced	Very involved	In-experienced enthusiasts	Math and science	Least involved
positive feelings	39.89 (5.43)	40.13 (5.37)	39.00 (4.75)	38.88 (5.80)	36.96 (4.17)
personification *	11.58 (3.43)	10.00 (3.80)	10.16 (2.64)	9.50 (2.70)	6.96 (2.44)
limited**	3.89 (1.04)	3.61 (.89)	3.88 (.88)	4.31 (1.23)	4.48 (.65)
servant (V228)	3.53 (1.34)	3.57 (1.24)	3.24 (1.27)	3.63 (1.10)	3.92 (.86)

* significant differences between group five and the rest of the groups, group one and group four
** significant difference between group five and groups one two and three, group two and group four.

As for the perceiving the computer as a limited and unpredictable entity, the "least involved" group of users has significantly higher scores than the "experienced" group (type 1), the "very involved" group (type 2), or the "inexperienced enthusiasts" group (type3), which all

consist of more experienced users. In addition, users in the "math and science" group (type 4) had significantly higher scores on the "limited" scale than users in the "very involved" group (type 2), who are the most experienced and involved users. Thus, it seems that the least experienced users perceive the computer as more limited and the most experienced users perceive it as least limited. This perception does not appear to be related to the less experienced users having many more problems with the computer than they expected. There are no significant differences between the users types in overall satisfaction with their personal computer ($\chi^2(12, N=141)=9.87$, $p=.627$), having greater rewards than expected ($\chi^2(16, N=141)=10.566$, $p=.836$), or having greater problems than expected ($\chi^2(16, N=141)=16.279$, $p=.434$). It therefore seems to be related to not being able to use the computer to its full capacity because of lack of experience and knowledge.

B. understanding

There are significant differences between the five users types on the four understanding variables using MANOVA (F(Wilks)$=5.780$, $df=16$, $p<.0001$). One way analyses of variance show that the five groups differ significantly on all variables (see table 23).

Table 23
Means and standard deviations of the five types on the understanding scales

	TYPES				
	experienced	Very involved	In-experienced enthusiasts	Math and science	Least involved
hardware* interest	6.05 (2.46)	7.22 (1.78)	5.52 (2.38)	6.28 (1.63)	4.24 (2.42)
general** interest	11.69 (5.49)	15.44 (4.83)	8.48 (4.12)	8.97 (4.73)	5.72 (1.45)
programmi interest***	6.39 (3.10)	7.87 (2.34)	3.88 (2.17)	5.69 (3.14)	2.96 (1.95)
how much know ****	4.33 (1.01)	4.35 (.98)	3.80 (1.26)	3.41 (1.46)	2.80 (1.53)

* significant differences between group five and the rest of the groups, group two and group three
** significant difference between group five and the rest of the groups, group two and the rest of the groups, group one and groups five three and four
*** significant differences between group two and the rest of the groups, groups one and groups three and five, group four and groups three and five.
****significant differences between group one and groups four and five, group two and groups four and five, group three and five

Posteriori tests (Duncan, p=0.05) show: First, in the interest in hardware scale ($F(4,136)=6.252$, $p=.0001$) the "least involved" group (type 5) had significantly lower scores than the rest of the groups. In addition, respondents in the "very involved" group (type 2) had significantly higher scores than respondents in the "inexperienced enthusiasts" group (type 3) who are mostly executives and use the computer mainly for financial

activities. Second, in the general interest scale ($F(4,136)=16.653$, $p<.00001$) the "least involved" group (type 5) has significantly lower scores than the rest of the groups, and the "very involved" group (type 2) had significantly higher scores than the rest of the groups. In addition, the respondents in the "experienced" group (type 1) had significantly higher scores than users in the "inexperienced enthusiasts" group (type 3) and the "math and science" group (type 4).

There are significant differences between the groups in the interest in programming applications and high level languages ($F(4,113)=13.544$, $p<.0001$). Posteriori test (Duncan, $p=.05$) show that the "least involved" group (type 5) and the "inexperienced enthusiasts" group (type 3) of the average users who are interested mainly in finance, had less interest in programming than the rest of the groups. More specifically, the "very involved" group (type 2) had significantly higher scores than any of the other groups. Both the "experienced" group (type 1) of knowledgeable users who were less involved than the "very involved" group and the "math and science" group (type 4) had significantly higher scores than the users in the "inexperienced enthusiasts" group and the "least involved" group.

There are also significant difference between the

group in the amount of knowledge they would like to have ranging from "only what I need" to "as much as possible" ($F(4,136)=7.345$, $p<.0001$). Posteriori analysis (Duncan, P=.05) show that the "experienced" group (type 1) and the "very involved" group (type 2) which included the more experienced users had significantly higher scores that users in groups the "least involved" group (type 5) and the "math and science" group (type 4). Users in the "inexperienced enthusiasts" group (type 3) were in the middle. They had significantly higher scores than users in the "least involved" group but not the users in the "math and science" group.

C. style of work

There are significant differences between the groups in their style of work (MANOVA- F(Wilks)=2.183, df=12, p=.012). One way analyses of variance show are significant difference is trying out things rather than using the manual (V277) ($F(4,136)=2.475$, p=.05), and marginally significant in improvising (V279) ($F(4,136)=2.187$, p=.079). The differences in trying to document as much as possible (V282) are not significant ($F(4,136)=1.811$, p=.13). The Duncan (p=.05) posteriori test for V279 shows that the "experienced" group (type 1) and the "very involved" group (type 2) (the most

experienced users) had higher scores than the rest of the groups. These results were not surprising since positive answers on this scale was found to be related to experience.

Table 24
Means and standard deviations of the five types on the "hacker" items

	TYPES				
	experienced	Very involved	In-experienced enthusiasts	Math and science	Least involved
try out	3.53 (1.42)	4.00 (1.00)	3.52 (1.05)	2.94 (1.34)	3.48 (1.36)
improvise	3.53 (1.38)	3.70 (.97)	3.28 (1.17)	3.28 (1.11)	2.76 (1.27)
document work	2.78 (1.10)	2.91 (1.08)	2.36 (1.12)	3.13 (1.10)	2.64 (1.22)

Although the difference between the groups on V282 are not significant ($F(4,136)=1.812$, $p=.130$) the results of a posteriori test are reported (see table 24). The only difference are between the "math and science" group (type 4) and "inexperienced enthusiasts" group (type 3) Member in the "math and science" group reported they document what they do more than members in the "inexperienced enthusiasts" group. These results show that documenting one's work might very well be related to the occupations and the nature of work these two groups do, and not to hacking.

3. Personality related variables

Some of the questions asked users to project their wishes and fears into their personal computer. One question asked what they thought before they bought the computer it would do for them. As was reported above the answers reveal two main factor: one is general improvement, and the other help with work and make life more easy and convenient. The other question asked about initial barriers for buying a computer. Three factors were found: low confidence about computers, being confused and needing help, and weighing expense versus immediate need.

Difference among the five types when all the personality related variables are are taken into account (low confidence, confusion, expenses versus need, general improvement, help only in work) are significant (MANOVA F(Wilks)=3.196, df= 20, p=.001). Oneway analyses of variance show significant differences among the groups on two variables. First, general improvement ($F(4,136)=12.625$, $p=<.0001$). A posteriori test (Duncan, $p=.05$) shows that the "least involved" group (type 5) had significantly lower scores than the rest of the groups. In addition the two groups of most experienced users, the "experienced" users and the "very involved" had higher

scores than the "math and science" group. The "experienced" group (type 1) was also different from the "inexperienced enthusiasts" group (type 3) (see table 25). Another difference is in low confidence ($F(4,136)=2.193$, $p=.073$). A posteriori test (Duncan, $p=.05$) shows that the "math and science" group (type 4) had lower confidence than the "very involved" group (type 2).

Table 25
Means and standard deviations of the five types on the personality related scales ($N=141$)

	TYPES				
	experienced	Very involved	In-experienced enthusiasts	Math and science	Least involved
general * improveme	25.39 (4.77)	24.87 (4.87)	22.00 (5.35)	19.97 (5.47)	16.96 (5.63)
work only help	12.83 (1.77)	12.00 (2.37)	11.76 (1.88)	12.28 (2.13)	12.40 (2.45)
low ** confidence	3.50 (1.95)	2.83 (1.19)	3.92 (2.16)	3.16 (1.69)	4.28 (2.57)
confused	10.83 (3.87)	8.52 (3.72)	10.32 (4.39)	9.94 (4.39)	10.03 (4.25)
need	7.83 (2.93)	6.83 (2.79)	7.96 (2.57)	7.38 (2.56)	7.59 (2.78)

* significant differences between group 5 and the rest of the groups, groups 1 and 2 vs. group 4, group 1 and group 3.
** marginally significant differences between groups 2 and 5 ($p=.073$)

The Five Types and Computer Related Behavior

What kind of relation exist between the computer types and behaviors related to computers use such as, amount of software borrowed, type of help used when encountered problems, belonging to a user group, improvisation while working on the computer, or average hours of work, are of interest in the study. Some of the variables were collapsed to prevent having a large percentage of the cells with less than 5 observations.

Table 26
Average hours PER WEEK of pc use by the users type

COUNT / ROW PCT	AVERAGE HOURS 0-10 hr	11-20	21-30	>31 hr	ROW ROW TOTAL
Experienced	17 47.2	7 19.4	3 8.3	9 25.0	36 25.5
Very involved	3 13.0	5 21.7	5 21.7	10 43.5	23 16.3
Inexperienced enthusiasts	16 64.0	3 12.0	1 4.0	5 20.0	25 17.7
Math and Science	12 37.5	13 40.6	3 9.4	4 12.5	32 22.7
Least involved	11 44.0	9 36.0	4 16.0	1 4.0	25 17.7
COLUMN TOTAL	59 41.8	37 26.2	16 11.3	29 20.6	141 100.0

CHI-SQUARE	D.F.	SIGNIFICANCE
28.907	12	0.004

There are significant difference between the groups in the average hours per week they spend working on their personal computers ($\chi^2(12, N=141)=28.907$, $p=.004$). More users in the "very involved" group (type 2) than in any other group work more than an average of 31 hours per week. More users in the "inexperienced enthusiasts" group (type 3) work an average of 10 hours or less a week than users in any other group (see table 26).

Table 27
Proportion of use which is related to work and the user type

	% USE				
COUNT / ROW PCT	less than 25%	about 50%	about 75%	almost all	ROW TOTAL
Experienced	7	8	9	12	36
	19.4	22.2	25.0	33.3	25.5
Very involved	6	2	4	11	23
	26.1	8.7	17.4	47.8	16.3
Inexperienced enthusiasts	8	4	5	8	25
	32.0	16.0	20.0	32.0	17.7
Math and science	3	1	3	25	32
	9.4	3.1	9.4	78.1	22.7
Least involved	3	3	4	15	25
	12.0	12.0	16.0	60.0	17.7
COLUMN TOTAL	27	18	25	71	141
	19.1	12.8	17.7	50.4	100.0

CHI-SQUARE	D.F.	SIGNIFICANCE
17.496	12	0.132

This result is strengthened by the previous finding (see "in search of hackers"), that amount of time spent working on the computers is significantly related to computer expertise. However, there is a different among the groups on the time spent on the computer which is related to work. The proportion of computer use which is related to work is much higher to users in the "math and science" group (type 4) and the "least involved" group (type 5) than any other group (see table 27).

Table 28
Using bulletin boards (BB) by the user type

COUNT / ROW PCT	BB Yes	BB No	ROW TOTAL
Experienced	7 19.4	29 80.6	36 25.5
Very involved	17 73.9	6 26.1	23 16.3
Inexperienced enthusiasts	4 16.0	21 84.0	25 17.7
Math and science	3 9.4	29 90.6	32 22.7
Least involved	1 4.0	24 96.0	25 17.7
COLUMN TOTAL	32 22.7	109 77.3	141 100.0

CHI-SQUARE	D.F.	SIGNIFICANCE
43.462	4	0.0001

In addition, there are significant differences between the groups in using bulletin boards (χ^2(4,N=141) 43.462, p=.0001). Member of the "very involved" group use bulletin boards much more than members of any other group (73.9% comparing to 19.4% in the "experienced" group (type 1), the second group with many bulletin board users, see table 28) .

Table 29
Belonging to user groups by the user type

COUNT / ROW PCT	User groups: Yes	User groups: No	ROW TOTAL
Experienced	11 30.6	25 69.4	36 25.5
Very involved	16 69.6	7 30.4	23 16.3
Inexperienced enthusiasts	16 64.0	9 36.0	25 17.7
Math and science	7 21.9	25 78.1	32 22.7
Least involved	5 20.0	20 80.0	25 17.7
COLUMN TOTAL	55 39.0	86 61.0	141 100.0

CHI-SQUARE	D.F.	SIGNIFICANCE
24.416	4	0.0001

There is no difference among types of users in the proportion of their software they borrowed χ^2(12,N=141) =5.134, p=.953). It might be the case that some of the

respondents whose software is largely borrowed were reluctant to report it. A possible indication for that possibility is that although many more users of the "very involved" and the "inexperienced enthusiasts" groups belong to computer user group (see table 29), and according to our participant observations in users groups meetings participants trade software (not necessarily commercial) quite regularly, there is no difference in their answer to the software question.

Table 30
Leave and try again by the user type

COUNT / ROW PCT	Leave and try later: Rarely		frequently	ROW TOTAL
Experienced	12 3.3	12 33.3	12 33.3	36 25.5
Very involved	4 17.4	9 39.1	10 43.5	23 16.3
Inexperienced enthusiasts	5 20.0	15 60.0	5 20.0	25 17.7
Math and science	6 18.8	19 59.4	7 21.9	32 22.7
Least involved	7 28.0	8 32.0	10 40.0	25 17.7
COLUMN TOTAL	34 24.1	63 44.7	44 31.2	141 100.0

CHI-SQUARE	D.F.	SIGNIFICANCE
11.050	8	0.199

There are also no significant difference between the groups in the type of help they use when having problems. The marginals show that more experienced users use on line help. Interestingly, when there are problems the most experienced and involved users (type 2), and the ""least involved" users (type 5) leave and try again later (see table 30). Most users in all groups get help from friends ($\chi^2(8, N=141)=8.957$, $p=.346$).

Demographic variables and the users types

There is a significant difference in the relations of gender and users types ($\chi^2(4, N=141)=10.267$, $p=.036$). The "inexperienced enthusiasts" group of intermediate users who are mainly interested in finance and many of them hold managerial jobs, is the only one that has about an equal number of men and women, and 35.3% of all women in the sample belong to it (see table 31).

The difference between the age of the respondents in each group are not significant, ($\chi^2(12, N=141)=17.496$, $p=0.132$). However, more than a half of the people in the "experienced" group and the "least involved" group are younger than 40 years old. While the people in the rest of the groups are older (see table 32). The lack of difference between the age of users who are involved with computers might be explained by early exposure of the

older users to mainframe computers. However, there are no significant differences between the age groups and exposure to mainframe computers ($\chi^2(3,N=141)=7.150$, $p=.067$). Actually users who are older than 50 years had less experience with mainframe computers than younger users.

Table 31
Gender by the user type

COUNT / ROW PCT / COL PCT	GENDER: Men	GENDER: Women	ROW TOTAL
Experienced	29 80.6 27.1	7 19.4 20.6	36 25.5
Very involved	20 87.0 18.7	3 13.0 8.8	23 16.3
Inexperienced enthusiasts	13 52.0 12.1	12 48.0 35.3	25 17.7
Math and science	26 81.3 24.3	6 18.8 17.6	32 22.7
Least involved	19 76.0 17.8	6 24.0 17.6	25 17.7
COLUMN TOTAL	107 75.9	34 24.1	141 100.0

CHI-SQUARE	D.F.	SIGNIFICANCE
10.267	4	0.036

Table 32
Age BY the user type

COUNT / ROW PCT	AGE: Under 20	30-39	40-49	50-59	ROW TOTAL
Experienced	6 16.7	15 41.7	7 19.4	8 22.2	36 25.5
Very involved	4 17.4	4 17.4	9 39.1	6 26.1	23 16.3
Inexperienced enthusiasts	1 4.0	4 16.0	12 48.0	8 32.0	25 17.7
Math and science		10 31.3	12 37.5	10 31.3	32 22.7
Least involved	3 12.0	9 36.0	6 24.0	7 28.0	25 17.7
COLUMN TOTAL	14 9.9	42 29.8	46 32.6	39 27.7	141 100.0

CHI-SQUARE	D.F.	SIGNIFICANCE
17.496	12	0.132

There are also some differences between different kinds of occupations and the user types ($\chi^2(12, N=141) = 17.496$, $p=.04$). Respondents' occupations were divided into 3 categories: mathematics and computer related occupations, social and exact science, and humanities (including faculty in the humanities, actors, writers lawyers, etc.). The results show that most respondents with mathematics and computer related occupations are in the group of "experienced" users (type 1); most respondents with social science or exact science

occupations are in the "math and science" (type 4); and respondents with occupations in the humanities are divided between the groups and are mainly in the "least involved" (type 5), the "inexperienced enthusiasts" (type3) and the "experienced" groups (type 1) (see table 33).

Table 33
Occupations by the user type

COUNT / ROW PCT / COL PCT	OCCUPATIONS: math, computer	social, exact sc	humaniti	ROW TOTAL
Experienced	16 48.5 39.0	5 15.2 15.2	12 36.4 20.3	33 24.8
Very involved	8 38.1 19.5	5 23.8 15.2	8 38.1 13.6	21 15.8
Inexperienced enthusiasts	4 16.0 9.8	5 20.0 15.2	16 64.0 27.1	25 18.8
Math and science	7 23.3 17.1	13 43.3 39.4	10 33.3 16.9	30 22.6
Least involved	6 25.0 14.6	5 20.8 15.2	13 54.2 22.0	24 18.0
COLUMN TOTAL	41 30.8	33 24.8	59 44.4	133 100.0

CHI-SQUARE	D.F.	SIGNIFICANCE
16.253	8	0.039

NUMBER OF MISSING OBSERVATIONS = 8

It is interesting that 38% of the "most involved" users were not computer specialists but their occupations belong to the humanities (although they consist only 13.6% of the people who with occupations in the humanities).

CHAPTER FOUR

DISCUSSION

The sample in this study was similar to other samples of home-computer users in being quite homogeneous (Watkins & Brimm, 1985; McQuarrie et al., 1984; Dickerson & Gentry, 1984; "how our readers", 1983; Mossberg, 1985). The majority of respondents have a high socioeconomic status; middle or upper-middle incomes and high level of education. However, respondents in this sample seem to be more work oriented than respondents in other samples. Their use of the computer was much lower for games and much higher for word-processing. For the majority of respondents in this sample (69.1%), the expectation that their personal computer would help them with their work proved to be the most important expectation. These discrepancies might be attributed to the different kinds of computers respondents in the other studies. They also might be attributed, at least partly, to the time elapsed since the other studies were conducted. During that period, the role of computers has changed to that of a work-tool (Rosenberg, 1986; Horwitz, 1986).

The sample used in the present study was more limited and specific than in other samples. In the other samples, users of various kinds of personal computers and home computers were included. The present study selected respondents who used only IBM or IBM compatible personal computers. As discussed in the introduction, the focus on personal computers, as opposed to home computers, was intentional. Personal computers are more powerful machines, and the special characteristics unique to computers, such as their interactiveness and complexity, are more pronounced in them, and were expectedly to lead to stronger symbolic meanings. Since IBM personal computers are the most popular and widely used (Rosenberg, 1986), and since the questionnaire was written on computer diskettes (which would have been required to specially programmed and prepared for each kind of computer, and required more time and money than was available) IBM and compatibles were selected. The sample was also selected only from New York City and its surrounding, because it was more economical to focus on a specific area, where there is a large concentration of personal computer users.

Nevertheless, unlike other studies, the sample in this study was selected from various sources, designed to cover a large range of computer users, and was not

limited to the specific populations most commonly used, i.e., readers of specific magazines. The focus on a specific machine and the setting of New York City highlights the issues and the arguments presented in the literature. If any of the concepts discussed in the literature was to be found, it was most likely to be found among users of the most powerful personal computers living in a computer-oriented environment.

As for the study itself, it should be born in mind that all respondents, even those who reported limited understanding of and experience with computers, were exposed to computers and used them at home. (In fact, even some of the people who were exposed to computers but used them only in a very limited way, were not included in the study because they had problems figuring out how to load the questionnaire). Images, feelings or perceptions of people who were never exposed to computers, or those who resist using them may be completely different than those of even the least experienced users in this sample. Even those with limited knowledge of computers might be less threatened by them than those who has never been exposed to computers.

Types of Computer users

Users' involvement with computers, their expertise, the way they use computers, and activities which are related to computing such as reading computer magazines or using bulletin boards appear to be indicators of the type and intensity of computer use. Two attempts were made to find a typology of computer users who cluster on these variables. First, by trying to identify the type most discussed in the literature, computer hackers; second, by constructing a general typology of all users.

A. In search of "hackers"

Most of the literature about computer users mentions "hackers" as a distinct type. Hackers were identified by the large amount of time they work on the computer, usually in unconventional hours, and by their unstructured, intuitive style of work (Weizenbaum, 1976, Levy, 1974, Wilkes, 1984, Turkle, 1980, 1984). The present study included a question which asked respondents if they consider themselves hackers. As was described in the Results section, it appears that at least some users used the term "hacker" differently and described themselves as such although they were not very involved in computer work. In addition, a cluster analysis of users' computer-related behaviors which included

questions about users' style of work (which could identify hackers), did not result in any types which fits the description of hackers in the literature. Inclusion of questions about work style or amount of time spent on the computer actually seemed to interfere rather than help in finding interpretable clusters of individuals.

It appears more probable from the results that improvisation while working on the computer and time spent on the computer are more related to computer expertise than to computer hacking. Moreover, some aspects of style might even be related to the nature of users' occupation. Faculty members, for example, document more than any other users but do not appear to be structured programmers; many of them do not even know how to program.

There are three possible explanations for the not identifying hackers. First, the questions asked in the study about style of work might not be the right ones for distinguishing hackers from other users. It also may be impossible to find out about a "hacker work style" from questions alone and direct observations might be needed. Second, there may be problems with the "hacker" concept itself. Computer use has changed since hackers were discussed in the literature. Then, computers were mainly programming tools; at present they are used as a multi-

purpose work tool. Many respondents use the computer mostly as word-processors and do not know how to program. Third, it is possible that style of work is in fact more closely related to the amount of experience with computers, as was argued by Green et al. (1982) and as was found in this study than to users' personality. Thus, style of work might not be as good as an indicator for recognizing hackers as was previously assumed.

Thus, it seems that, at least in this sample, the way people use computers is not inherent in users' personality. Hackers were not identified by their style of use, and perceived control did not seem to be related to users relations to the computer. Next step was then, to focus on what people actually do with their computer. Therefore, types of computer users were identified according to their actual computer-related behaviors.

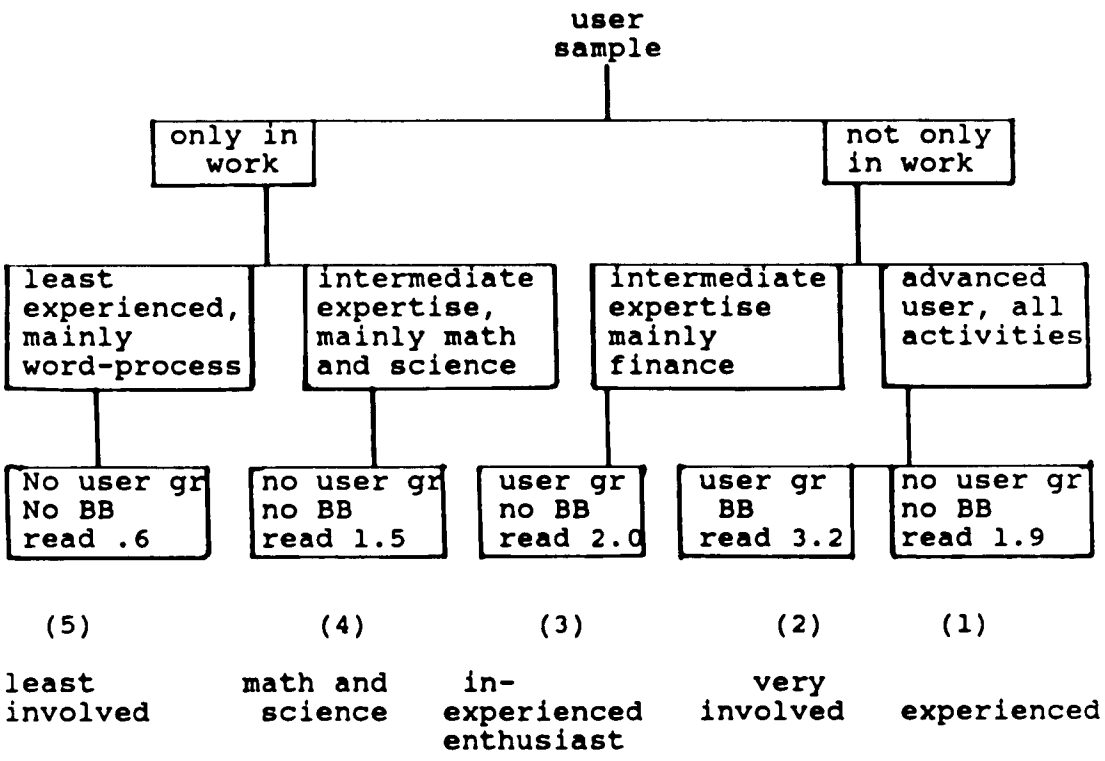
B. The five user types

Types of computer users were identified by their activities and expertise instead of users' personality, using a cluster analysis (a statistical procedure that classifies individuals into groups according to their similarity and dissimilarity on specified variables). The variables included in the cluster analysis were: The number, importance, and kinds of activities the computer

is used for; level of computer expertise; knowledge of programming; the number of computer magazines read; and self description as hackers. (Although "hackers" as a separate type of computer user were not found in this study, self-description as an hacker, regardless of whether beginners and novices were included or omitted, was found to have an important contribution to the identification of meaningful and distinctive user types).

Five groups of users emerged from the cluster analysis as the most comprehensive and reasonable clusters: Very involved enthusiastic and experienced users ("very involved"); experienced but less involved users ("experienced"); enthusiastic users who are not very experienced and focus on financial applications ("inexperienced enthusiasts"); users who have intermediate expertise, are not very involved with the computer, and use the computer mainly for mathematic and scientific work ("math and science"); and users who are neither involved nor experienced and use the computer mainly for word-processing ("least involved"). (For visual presentation of the type of users see Figure 1).

Figure 1
The types of users and identifying characteristics



BB - Use computerized bulletin boards
user gr - Computer user group
read - Average number of computer magazines read

C. Comparing the user types

Comparisons among the user types on the variables describing users' subjective relation to the computer, on the control scales, and on computer-related behaviors showed consistent differences among them. First, the "very involved" users seemed to be similar to "hackers" in their involvement with computers. The descriptions in the literature of two writers who saw themselves as addicted to the computer helped identify the behaviors which are typical of "very involved" users (see Watson, 1985; MacHovec, 1984). In addition to long hours (which are related to experience with the computer), such users: viewed computer use as fun, read large number of computer magazines, participated in users groups, and communicated extensively with other users.

Similarly, the members of the group of the most involved users use the computer for most activities, especially programming. They are very advanced users, and they read regularly an average of more than 3 computer magazines. More people in this group than those in any other group: worked more than 31 hours a week on the computer, were involved in user groups and used computer bulletin boards (which are usually used as means of communication with other users with similar interests,

acquiring software, and searching for information about quality of hardware and software). Members of this group also expected the computer to be fun and to improve their life in general (significantly more so than members of the least involved group and the math and science group). Thus, this "involved user" type used computers for a large range of activities. This user also spent much of his/her time in activities surrounding computers such as reading computer magazines, communicating through computerized bulletin boards, and being involved in user groups.

The "least involved" group of users was different from the rest of the groups on many of these variables. More than respondents in any of the other groups, people in this group reported negative perceptions of computers, and low confidence about using them. They saw the computer as limited and personalized it less. They were also less interested in knowing more about computers operations, programming or hardware, and expected less benefits from having it. In addition, they used the computer less and were less involved in activities around it such as user groups or bulletin boards. The members of this group seemed to be using the computer because they had to and not because they wanted to; over 60% of

them use computers almost exclusively for work, mainly for word-processing.

The only other group to emerge from the cluster analysis which displayed similar, although not as extreme, negative attitudes toward computers is the math and science group (composed mostly of faculty members). Members of this group displayed less personification of the computer and saw it as more limited than the other three groups. They did not expect the computer to be fun or to improve the quality of their life, and were not very interested in knowing as much as possible about computers (especially theoretical knowledge). Again, their main motivation for using the computer was work. Members of this groups more than in any other group (78.1%) use the computer almost exclusively for work. Still, unlike members of the least experienced group, members in this group use the computer for mathematical and scientific work and not only for word-processing. Thus, the fact that users in this group were more familiar with computers and with a rational and scientific way of thinking, made them less intimidated by the machine than members of the least involved group. However, it seems that members in this group (and the least involved group) used the computer mainly because they had to, and therefore enjoyed the computer less than

members of the other groups, even those who understood computers less than they.

Another group identified in the cluster analysis consisted of computer enthusiasts who were not very experienced users. In addition to word-processing, they seemed to be mainly interested in financial uses. They were not interested in programming, theoretical knowledge, or knowing a lot about computers, but they perceived computers positively. They expected the computer to improve the quality of their life, had an image of the computer as a person and did not see it as limited. In addition, only in this group and in the group of the most involved computer users, do more than 60% of the people belong to computer user groups. Users in this group seem to enjoy using computers, many of them use the computer for fun and not as part of their work. However, they are not computer specialists and do not seem to have the time or the motivation to be more involved in computer use. Members of this group do not seem intimidated or frustrated by their lack of knowledge. It might be because, unlike the groups of the least experienced users and the math and science users, they appear to use the computer mainly because they want to and to got what they expected from using it.

In addition to the group of the very involved users, there was another group composed of experienced and knowledgeable users (experienced), but less involved and enthusiastic. Comparing the two groups might help in understanding the difference between knowing computers and working with them as members in the very involved group seemed to, and being "hooked" on them as members in the experienced group seemed to be. The main difference between the two groups is in the amount of interest and knowledge each reported. Users in the very involved group were more interested in all aspects of computing, especially theoretical issues and programming than were users in the experienced group, although members in the latter group were still more interested than any of the other groups. In addition, members in the very involved group worked more hours per week on the computer and were more involved in social activities around it such as users groups and computerized bulletin boards. 43.5% of the users in the very involved group spend more than 31 hours a week working on the computer while only 25% of users in the experienced group do so; 73.9% users in the very involved group versus 19.4% users in the experienced group use computer bulletin boards; and 69.6% of the users in the very involved group versus 30.6% of the users in the experienced group belong to a users group.

Members in the very involved group also seemed to display more self-confidence in using computers, and to see the computer as less limited, although these differences were not statistically significant.

Personality and the Computer

A. Relation to the computer

Respondents' relations to the computer were found to be connected to users' involvement and experience. Users' feelings when they work on the computer were found to consist of generalized positive or negative feelings. Those who were more experienced or enthusiastic about computers seemed to have more positive feelings. The computer was perceived positively by experienced users who were knowledgeable about the way it operates probably because they are more successful in accomplishing what they want on the computers and therefore are less frustrated.

Three images of the computer were found: the computer as a person and a friend, the computer as a limited and useless entity and the computer as a servant. The image of a servant did not appear to be related to the other images or to the feelings. It is possible that this image does not have strong relations with any of the

other variables because it has different meanings to different people. Some see the computer as an efficient servant which does what they want; others thought it would do what they want but were disappointed. Clearly, the other two images, as a person and as a limited entity, have opposite symbolic meanings. They correlated negatively, and while "person" related to positive feelings when working on the computer and strong interest in the way the computer operates, "limited" related to negative feelings and lack of interest or understanding of the ways computers operate.

Users who are least involved with computers are those that saw them as limited and unpredictable. The "limited" image of the computer seemed to be a defensive reaction to problems encountered while using the computer. It is this user's understanding of the computer that is limited. These users seemed to be putting the blame for problems they have operating the computer on the computer itself. However, users who put the blame on the computer do not seem to be consciousness of this reaction. When asked about the reasons for problems they had while working on the computer less than five percent answered "somehow this computer seems to have it in for you".

The reaction of putting the blame on the computer and perceiving it as limited, useless, and unpredictable does not fit the existing literature concerning the relationships between the amount of knowledge about computers and users' perception of the machine. It was suggested in the introduction that users with only a small amount of knowledge might feel anxiety and low self esteem, and in addition, might misperceive computers by seeing them as omnipotent independent entities (Turkle, 1980; Perrolle, 1983; Weizenbaum, 1976). Data from this study regarding users' interests in a large range of computer-related topics did not support these assertions. The results did indicate that while people who do not know much about computers did express some negative feelings of incompetence, dependency and anxiety when working on them, these negative feelings and lack of understanding did not seem to lead to attribution of omnipotence to the computer or even to low self-esteem, but to the opposite. Users attributed problems they encountered to the computer and not to themselves. They seemed to project their frustrations onto the computer so that the less they understood the more they "put the computer down" as limited, useless and unpredictable.

It should be taken into account, however, that the sample in this study consisted mostly of financially

successful professionals who are involved with their careers. The findings may be different and closer to the original hypotheses for computer users who are less successful in other aspects of their lives. In such a sample, respondents who have problems with the computer might react less confidently and put more blame on themselves rather than, as respondents in the present sample seemed to do, on the computer.

As indicated earlier, it also has been claimed that people who have extensive knowledge of computers are aware that because of their complexity computers have limitations and cannot be completely predictable or reliable. As described by Lucky (1984):

> The experience of most people who work with computers is to learn a certain wary distrust for them. It is not a question of malevolence but rather the overwhelming complexity that cannot be completely and predictably controlled (p. 4).

Thus it was expected that experienced and knowledgeable users would not see the computer as a person, and certainly not as a friend (Lucky, 1984). However, the results seem to point in the opposite direction. Experienced computer users who are really aware of the computer's limitations did not perceive the computer as a limited entity. They seem to appreciate what the computer is capable of doing and have realistic

expectations. Therefore, they focus on the computer's constructive and helpful qualities rather than on its problematic aspects. The image of the computer as a person, partner and friend went with successful work with the computer and broad knowledge of the way it operates. Experienced and enthusiastic users seemed to anthropomorphize the computer more than those who were less involved. These results confirm Turkle's (1980) argument that the personification of the computer is not related to a lack of understanding of its internal processes, but is an integral part of the unique structure of the computer. She said that "Some hope that objective knowledge about how computers "really" work will make it [anthropomorphization] go away. But anthropomorphic imagery, supported by the computer's projective capacities, seems deeply embedded in the nature of computation" (p. 23).

However, personification of the computer might also be explained by the need of the user to feel control through relating to the computer as a partner, as was argued by Cathcart and Gumpert (1983):

> The human partner activates the computer, but once the encounter has begun the computer program controls the situation. To compensate for the loss of control we anthropomorphize the computer; i.e. give it human qualities. The human partner can then

> "role play" a face-to-face interaction because all the components of dynamic communication exist, except that one of the partners is a machine. (p.271)

This agency attributed to the computer was described by one of the interviewees as especially useful for debugging computer programs. The question "what "it" (he) doing now?" was for him the best strategy for solving problems while working on the computer.

Another important factor in users' perceptions seems to their motivation for computer use. If they seldom use it for any other reason than work, they perceive it more negatively and are less interested in knowing about it than if they also use it for personal reasons which they enjoy. As for the complexity of the computer, it seemed to be very important in differentiating user types. The most involved users are far more interested in understanding all they can about computers than any of the other user types. The more experienced the users were, the more they found it important to understand most aspects of computer use, while those who were less experienced and knowledgeable had less interest in knowing more than the minimum necessary. This latter group might avoid dealing with it, or simply have other activities higher on their priority list.

B. Perceived Control and the Computer

In most of the literature, control is considered a major psychological construct for understanding relations to the computer and computer-related behaviors. The SOC scale (Christie and Paulhus, 1981; Paulhus, 1983) was chosen because its division of control into personal and interpersonal spheres corresponds to the control-related issues raised in the literature about computer users. People with high personal efficacy perceive themselves as controlling their nonsocial environment (a construct similar to internal locus of control or intrinsic motivation) and therefore, it was argued, they will interact effectively with computers (Lepper, 1985; Coovert & Goldstein ,1980). Unlike the potential effect of perceived personal efficacy, which was extrapolated from other areas of activities to computer use, discussions about interpersonal control are focused on relations to the computer. With respect to interpersonal control, it has been argued by others that people who are very involved with using the computer perceive themselves as lacking the ability to control their interpersonal environment and therefore prefer the controllable and predictable relations with the computer to human relations (Weizenbaum, 1976; Turkle, 1984).

The original two control subscales in the SOC scale (see the Results section) did not fit the data of the present study. These results might be because the scales are not valid ,or because the sample size is small and the respondents were not representative of the general population. It was possible to use the original subscales as they appear in the literature (as many do with the Rotter I-E scale), but it seemed preferable to find factors which were more consistent with the data in the present study (analysis of the data using the two original control scales is also presented in the Results section). Four factors fit the data well, although some of the original items did not load highly on any of them and were dropped out (see the Results section). One factor which the original subscales lacked was added; a combination of interpersonal control and personal efficacy, describing those people who are ambitious achievers and work hard to get what they want, but also use interpersonal control to manipulate others to help them get it. They usually make their plans work in two ways; by learning almost anything they set their mind to and interpersonally by steering an interviewer to the right topics or by being able to arrange to meet the "right" people. The other three factors found were: personal efficacy which is reduced to personal

achievement through hard work, interpersonal control (limited to group situations), and the ability to create and maintain personal relationships as an alternative way of interaction which is not through control.

In general, people with higher scores on the control scales expressed more positive feelings and positive images of the computer. In addition, all the control scales (excluding personal relationships) were negatively related to the "limited" image. As was hypothesized, personal efficacy is strongly related to positive feelings toward working on the computer. These results are not counter-intuitive. It seems reasonable that individuals who perceive themselves as successful in controlling their nonsocial environment would also succeed in operating a computer and would express feelings of competence and control. The image of the computer as a person was also negatively related to the "limited" image and positively (but not significantly) related to personal efficacy. However, the personification of the computer was stronger for users with high scores on social manipulation and ambition (achievement). It seems that people who seek to control their environment through manipulation find it easy to relate to the the computer by perceiving it as an entity which can be manipulated.

It was also hypothesized that people who have low interpersonal control scores will have stronger relations to the computer. However, the only variable to which the interpersonal control scale was found to be strongly related was the "limited" image, and the direction of this relation was opposite to the original hypothesis. Users with low scores on the interpersonal control scale perceived the computer as limited and useless. The other scale related to interpersonal skills (not control)--the personal relationships scale--is barely related to any of the feelings or images scales. The change in the role computers played during the past few years, from a marginal entity used only by few experts and "hackers" into a popular work tool used by mainstream people, might explain the difference between the description of computer users in the literature and the results of this study. The computer is now used widely by people who are effective in the larger world, rather than by people who immerse themselves in computers as an escape.

The only variable which showed a somewhat different pattern of relationships with the two scales describing interpersonal skills is the servant image, although the relations were not strong. Users with high interpersonal control scores viewed the computer as a servant, while those whose scores on creating and maintaining close

personal relationships were high did not perceive the computer as a servant. These results seem to reflect different attitudes toward controlling others. People who emphasize warm interpersonal relationships did not project an image onto the computer as a subservient entity, a servant, while those who perceived others as controllable projected the same image on the computer. There were very small nonsignificant relationships between the servant image and either the personal efficacy scale or the ambition scale. (These results show that although the interpersonal control scale and the personal relations scale were correlated (r=.40), they do not represent the same construct, but seem to have different meanings, sometimes as with the servant image, even in two opposite directions. Thus, the decision to use two separate scales instead of the original interpersonal control scale seems to be justified).

The relations between the interpersonal control scales and understanding of how computers operate did not confirm the hypotheses of the study. The "understanding" variables are hardly related to interpersonal control. People with low interpersonal control did not seem to show more extensive knowledge of or interest in computers than did others. The only result which showed positive

(though not strong) relations between social skills and interest in computers is between the personal relationships variable and interest in hardware. People who did not maintain close personal relations were more interested in hardware. It seems that for some people who lack the ability to establish close personal relationships, dealing with things such as computer hardware is preferable to dealing with people.

As for the scales which are not solely concerned with interpersonal relationships, the strongest relations found between any of the control scales and the scales measuring understanding of the computer are those between the ambition scale and interest in programming. Since programming skills are very marketable, it seems reasonable that people who are high achievers (more than people with high perceive personal efficacy scores) will be interested in acquiring these skills. People with high scores on both the personal efficacy scale and the ambition scale have some general interest in the way computers operate.

As for the user types, in contrast to the hypotheses of the study and the related literature, there were no significant differences among the groups on any of the perceived control scales. "Control" as a psychological construct measured by these scales, did not seem to

explain users' behavior and perceptions beyond the fact that users with higher scores on the control scales had more positive feelings and images of the computer. People's perception of control over their environment is an important motivational force, and it seems reasonable to have predicted that people with a higher sense of control would have higher intrinsic motivations for work with computers (for review see Lepper, 1985). The description of Watson (1985) who saw himself as an addicted computer user illustrates this kind of motivation this sense of control creates: "your logic, your cleverness, your foresight imposed on the machine... you are god in your little universe" (p. 73). However, feelings of personal efficacy as a source of intrinsic motivation are important in many activities, and there is no obvious reason why they should be more significantly involved in computers use than in other activities. Even if people with high personal efficacy scores show more personal achievement than people with low personal efficacy scores, they are not necessarily capable computer users but might be capably involved in other areas.

As for interpersonal relations, data from this particular sample suggest that working with the computer did not serve as a substitute for personal relationships.

It is possible, of course, that this hypothesis was not confirmed because the "addicted" users were not present in our sample. Still, users who are very involved with computers were part of the sample, and they do not demonstrate the personality and pattern of interpersonal behavior described as in the literature typical to "hackers".

It is possible that in the early days of computers, when they were not as popular and widespread, involvement with computer work was related to users' personality. As the computer became commonplace, simpler to use, and more mainstream software was developed more central people use it. Therefore users' personality might no longer predict heavy usage. It is also possible that people who want to avoid interpersonal relationships do not choose computers as substitutes any more than they would other activities. Some might be very involved in their work or in hobbies, while others might not have the necessary skills for satisfying work with the computer.

Thus, although the scales of perceived control are related to positive perceptions and feelings toward the computer, they were not found to be as important to computer use as was expected. In general, computer users who understand a great deal about the way computers operate and perceive the computer positively have high

control scores. The involved computer users in this specific sample do not appear to be motivated in their interpersonal relationships by psychological issues related to control. It may be the case that when computers were not as popular and widespread as they are now, their use was related to users' personality and the very involved users may have been socially isolated. As computers become more popular and central in society, however, computers are used by people who are more socially central rather than by mainly marginal people, as was described in the literature. In addition, computer experts seem to gain social status and recognition. When children were studied, work with computers was found to involve substantial social interaction. Most children actually preferred working on the computer with others, and the computer experts among them gained social status and popularity (Lieberman, 1985).

Demographics

The demographic variables used in the analysis were gender, age, and occupation (the socioeconomic status of respondents in the sample was too homogeneous to be used in the analysis). Caporael and Thorngate (1984) have hypothesized that resistance to computers will be greater

among members of the older generation. The computer users in the present study were not as young as was assumed. In fact, about 28% are more than 50 years old, and less than 10% are less than 20 years old. The older users seem as involved in computer use as the younger users. These results do not necessarily mean that older people do not resist computers more than younger people; however, it seems that of the people who already use computers older people are as knowledgeable and involved as the younger ones. This also does not appear to be related to previous exposure of older people to computers, especially mainframe computers, since respondents who were over 50 years of age were not exposed to mainframe computers more than younger respondents. The results might be related, however, to the central place computers are beginning to occupy in society, especially in the workplace, which makes it necessary for people in central positions (who are usually older) to become familiar with computers and their applications.

The relations between computer use and respondents' occupations are also not as strong as expected, especially for people in the humanities. There is a difference between the occupations of different user types: Most of the people engaged in occupations in the

math and computer areas belong to the experienced and the very involved groups; many of the people whose occupations were in the social or exact science category belonged to the math and science group of users. However, people whose occupations are in the humanities did not seem to belong to a specific group. About as many belonged to the group of the least experienced users as belonged to the group of the experienced users.

Similar to findings in other studies (Watkins & Brimm, 1985), more men than women use computers, but within the sample of computer users there was not much difference between the way men and women use computer applications (except that women reported less interest in computer programming). As was expected, not many women belonged to the groups of the involved computer users. However, the majority of women did not belong to the group of the least experienced users either. 35.3% of the women belonged to the group of users who were not very experienced with computers but seem to have positive attitudes about them. This was also the only group in which men and women are about equally divided (48% are women). In the rest of the groups the vast majority are men.

There was not much difference between men and women on the control scales. Contrary to findings in the

literature that women more than men use personal relations as a source of power (Johnson, 1976; Henley, 1977; Falbo & Peplau, 1980; Deux, 1985), women in this sample did not have higher scores on the Personal Relationships scale than men. The only difference between men and women was in the ambition scale which included social manipulation: women had higher scores. It is possible that women who use computers are not representative and are more ambitious than the average woman or their male counterparts.

Conclusion

From machines used only by a few specialists and enthusiasts, computers have moved into mainstream society. The complexity created by computers has became part of by the complexity of the larger social setting. Rather than functioning merely as a tool, the computer has evolved into a package, its operation requiring, in addition to a diverse set of skills, certain beliefs about the advantage of computing, and appropriate social relations in the larger organizational context (Kling, 1980). The results of the study reflect the changes in the role of computer role in the larger social context. Computers today are used not only by enthusiasts and hackers but by people with high social status who occupy

central positions at work. Thus, users' personality and perceptions as described in the literature review appear to be outdated, and even the very involved computer users are apparently different from what was expected. Not only social scientists but the computer industry as well, failed to predict the widespread popularity that computers would attain, especially as a work tool. When IBM first produced its personal computer, it was targeted for home users. The computer did not come equipped with the hardware and the software for uses at work; its use for work purposes came as a big surprise (Lemmons, 1981; Lewis, 1987).

Most of the literature which described the special characteristics of computers and their potential influence on individual users' way of thinking and values focused on programming. The literature which described individual users' style of work with computers, especially hackers' style, also focused on programming style. However, the need to program in order to operate a computer is declining, and it is widely projected that even less of a need for programming will exist in the future, as computers become easier to use (Lucky, 1984; Kay, 1984; Rosenberg 1986). The results of this study seem to point to such a change in the function of computers. Only about a half of the sample knew how to

program at all, and many used only off-the-shelf software. For the vast majority the computer is first and foremost a working tool.

This move toward easy to use, friendly computers which do not require much specialized knowledge raises questions with respect to their possible effects on users. It has been argued that this kind of development will close the gap between computer "literates" and "non-literates" (Lucky, 1984). The ability to program is expected to become "an arcane skill, the mastery of which, although intellectually rewarding will not serve future need of students [in the education system] (Chen & Paisley, 1985, p.14). It has also been argued that there will be no need for non-technologists to know about the way computers work, just as they do not have to know how their television sets or their cars work (Kay, 1984; Lucky, 1984; Chen and Paisley, 1985; Peas et al. 1985). Others, however, claim that programming as such is an important skill, and provides a way for users to extensively utilize their computer potential. Paisley (1985) even claims that:

> Males and children of higher socioeconomic status are learning to control (that is, to program) the computer while females and children of lower socioeconomic status are learning to be controlled by the computer through their use of "canned" programs only" (p. 24).

What does appear to be the case is that as computers developed, preexisting software for a large variety of tasks became available so that programming is no longer essential for productive use. While the results of this study can not provide clear answers to all of the questions raised by these issues what was found is that many of the computer users in the sample were not proficient in programming, and saw the computer as just a tool for accomplishing specific tasks. It seems, however, that even for people who do not program and use only application software, those who said they use the computer mainly for practical reasons do not enjoy using them as much as others. Of the groups of the less experienced users, respondents who used computers for other activities besides work displayed more favorable attitudes and positive images of computers than did respondents who used the computer mainly for work. It should be stressed, however, that all users, even those who used it mainly for work, were satisfied with their computers.

Computers are more complicated than most other work tools and, while using them, users are liable to encounter problems they did not expect. With the

development of a wide range of packaged software, a new subculture of reluctant users seems to have emerged: Users who want to use computers for specific work needs who seem to get annoyed when things go wrong, and who do not have the patience or the knowledge to try and figure things out. These are users who perceive the computer as a useless, unpredictable, and limited machine. Those who enjoy using the computers in their free time, although often not more knowledgeable, seem to expect problems as part of the "game" and may even enjoy solving them. Thus an external source of motivation, such as work needs, is not sufficient for pleasurable work on the computer; users need an internal motivation as well in order to feel positive about computer use.

On the individual level, many experienced users seem to anthropomorphize the computer. Although many theorists are troubled by this tendency, the individual and social consequences of an anthropomorphization of the computer are not known. Personification of the computer might be inherent in the special qualities of computers, as claimed by Turkle (1980, 1984), who raised the possibility that users who personify the machine will "use the machines as metaphors for thinking about people" (p. 24). However, people personify other tools they are involved in using, such as their cars. It seems

reasonable, then, that the anthropomorphization of the computer may serve only as a cognitive strategy to deal with a non-human interactant, as claimed by Cathcart and Gumpert (1983).

The data gathered in this study did not support the assertions that involved computer users are a singular case of people who need a high degree of control on their environment. Relations between the perceived control scales and computer use did not indicate that involved computer users have less of a sense of control over their interpersonal relations than do less involved users. On the contrary, users with high scores on the interpersonal control scale (either the original with 10 items, or the one used in the study with only 5 items) reported more positive feelings when working on the computer and their images of the computer were more friendly and assured than respondents with low scores on the interpersonal control scales. In fact, involved and enthusiastic users seem to develop relationships with new friends who are interested in computers as well, they belong to user groups and communicate on computerized bulletin boards.

As for the fear that computers would create low self-esteem and feelings of worthlessness and powerlessness in some "ignorant" users - it was not confirmed in the study, at least not for this sample

consisting mostly of financially and professionally successful people. Inexperienced computer users seemed to be frustrated and angry, but did not appear to blame themselves for any problems they had operating the computer; they seemed to blame the computer instead.

More research is needed about factors which might affect peoples' involvement with computers. In the present study it appears that personality does not play an important role in computer-related behaviors or users' relation to their computer. However, aspects of the personality, such as cognitive style, and personal values which were not investigated in the study might explain individuals' attraction to computers and the way they use them. Perceived control over one's surroundings, does not seem specifically related to computer use, perhaps because it is an important factor in all activities. People who scored highly on the personal efficacy and ambition scales do have favorable attitudes toward computers, but they do not seem to be more involved in computer use. Computers do not seem to attract people who do not perceive themselves as having control over interpersonal environment more than they attract others. Nevertheless, it is possible that different control scales with higher validity or a sample which would include "real hackers" (if they still exist) might not

show the same results. Therefore, further investigation of the relations between control and computer use is warranted.

In sum, the results of this study shed some light on the relations between the affective, cognitive and behavioral components of computer use. It appears that experienced or enthusiastic users have positive attitudes and personify computers, while inexperienced and reluctant users perceive the computer as a limited entity. The possible effects of personification of the computer on users' relationships with other people should be further investigated. Knowledge of and experience with the computer seem to be related to users' attitudes and feelings, although the effect of using computers mainly for work, as compared with use for other reasons (such as fun and self improvement), also appear to play a role in users' relations to the computer.

APPENDIX A

The pilot investigation

The pilot research project consisted of:
(a) Participant observation of computers users in several situations: different user groups, mainframe computer users, and opening of new personal computer packages.
(b) Informal interviews with personal and mainframe computer users.

A. The participant observations

Participant observations of personal computers user groups started in April, 1984 for the IBM group and since its formation (June, 1984) for Macintosh user group, and lasted for about a year. There was at least one observer in each monthly user group meetings for about 12 months. There also were informal communications with the group leaders.

In both IBM and Macintosh user groups the age of most participants was between 30 to 50 (very few whiz-kids), most of them were White; few were Asians and even fewer Black. In the IBM users group the majority of participants were men (about 80%), while there more women

in the Macintosh group (about 40%). The meetings of both had the same structure: first announcements by the organizers and SIG (special interest group) leaders. Then, sessions in which users who have problems ask questions and others answer, this session was called questions and answers by the Macintosh group and RAM (random access memory) by the IBM group. After the general questions period there was a break followed by a formal presentation usually about new software or applications. The break was used for trading of software, information and opinions among the participants.

Both groups also had more formal and institutionalized ways of dissemination of information; monthly newsletters and distribution of freeware for only the cost of the computer diskettes and handling. Both groups had special interest groups (from wordprocessing to assembler) who met regularly outside the general meetings. The IBM group was the more established and had more members (about 1500 with about 300 attending meetings), but the Macintosh group was growing rapidly, and had about five hundred members in the end of the first year (about 150 attending meetings).

There were noticeable difference between the groups. Some of the differences might be attributed to the fact

that the Macintosh group was only formed when our observations started, and it dealt with a new machine, so most users needed help and information. Even those who were very knowledgeable about other computers needed to know more about new software and hardware. In the beginning, then, the differences of expertise and knowledge could not be as clear and noticeable as in the IBM group.

However, the differences between the groups did seem also to reflect different cultures, which appear to be inherent in the different types of machines and the nature of the users who preferred working with them. The Macintosh was publicized as a "friendly" machine and attracted people who were resisting computers or even those who had been afraid of them before. In the first meeting the organizers said they want "a friendly group with a friendly computer." The two organizers, a couple, told me they did not know much about computers, and their occupations were in the humanities. In all meetings, even after a year in which there were established "experts", speakers tried very hard be be clear to all level of users and when professional lingo was used, no one hesitated to ask the speaker to talk "English". In the IBM group on the other hand, the atmosphere seemed more "macho". Novices who asked "stupid" questions were

"put down" and even laughed at. Most of the group leaders were computer Professionals. Almost all speakers used Professional "lingo", without much consideration of new users. One very experienced IBM user who came once to the Macintosh group meetings summarized the differences by saying that "the questions there [in the Macintosh group] were too simple" and "the people there as not as good [as in the IBM group]".

Mainframe computer users were observed in the user room which served as a working space for maximum number of about 25 users at once. Many mainframe users had have no choice but to use the computer, and therefore lacked the enthusiasm of the personal computer users. The hardest part for mainframe users (and presumably for personal computer users, but they were not observed) seems to be starting up. Many novices found it hard to understand how to communicate with the computer, they were especially confused by the different levels of interaction, operating system, editing, running a job, and getting an output. They wanted someone to help them do their job, and usually did not try to understand more about in order to be more independent next time. Even more experienced users complained about the unreadable manuals, and needed help from each other in order to use complicated procedures.

The feelings of an inexperienced user opening a new package of personal computer seemed to be somewhat similar to the feelings of a novice starting to work on the mainframe. There are feelings of confusion, fear of destroying something, low confidence in one's ability, and lots of anxiety. In the participant observations conducted, even the experienced users needed help. There were problems with instruction, the documentations were invariably unclear, and in a few instances the hardware did not work. Even confident users were not sure if the computer did not work because of them or faulty hardware (twice it was the hardware).

B. informal interviews

The interviews were begun after quite a while of observing computer users. The interview schedule (see appendix C) was developed on the basis of the participant observations, informal discussions, and the relevant literature. The questions were an outline which covered many aspects of computer use and the interviewees were encouraged to discuss them in an unstructured way. The outline covered topics ranging from buying a computer and starting to work on it to expectations, type of uses and level of understanding. It also tried to tap possible types of users and their work style; practical versus

theoretical, control issues, trial and error versus systematic work etc.. Some of the questions focused on perceptions, images and feelings, and asked whether the computer changed the user's life. Other questions asked about interpersonal relations surrounded the computer, belonging to user groups, and help received and given.

Overall, thirteen people were interviewed by me (more were interviewed by others). Of the thirteen, three were experienced mainframe users who also had some experience working on personal computers, six owned IBM or IBM compatible personal computers, and two owned Macintosh. The five IBM personal computer users included two very experienced IBM and mainframe users, three experienced personal computer users and one novice. The Macintosh users include one experienced user and one novice.

The mainframe users had all reported the advantages of being your "own system manager" and not depending on anyone. On the other hand they all were aware of the limitations of personal computers. They all said that help is always needed, especially when people start, although they do not have patience with people who do not try to understand things by themselves before they ask for help. A computer science major said he preferred mainframe computers because they have more power and even the games require more intelligence while they require

mainly speed in the personal computer. He described mainframe hackers under some derision: "they know some technical details and tricks and think they know it all...they are not interested in theoretical issues and do not care about computer time...their motto is if it runs it is right even if they do not understand why...they are proud when no one understands what they did". He preferred more structured and documented work. The other interviewees did not encounter mainframe hackers.

One experienced personal computer user who refused to use the mainframe, said he liked the feeling of total control, the logic and rationality of computers, and the satisfaction when something he "created" worked. All users were delighted by their total control on the machine. They all exchanged their own programs and other software and ideas. All personal computer buyers were happy they bought the computer although it was quite expensive and felt it added something to their life. Only two did some computer consulting on the side; the rest used it for work and fun.

Interesting differences emerged in the interviews is that people with similar observed behavior had different subjective images of and feelings about computers, while people with similar images had very different behavior.

For example, two women whose knowledge of computers was quite limited and "played" with it in order to get used to it. One was very relaxed about using it and saw it as a partner, while the other was very apologetic and embarrassed about her lack of knowledge and described it as a toy, something which is not serious so one is not required to know much about it.

APPENDIX B

The Interview Outline for the Pilot Interviews

GENERAL QUESTIONS

1. Start with why and how bought the computer:
   In general and this specific one.

2. Do they use the computer for business.

3. Micro-computers and mainframe computers.

4. Did the computer change their life, and how?

A. Expectations
   1. Before buying:

   2. After buying -disappointments

B. Starting the computer

1. Opening:

   a. Step by step, jumped.
   b. How accurate were the instructions?
   c. Did they dare openings without help?
   d. Help? From whom, at what stage

2. Manuals, operations, software, etc.

C. Relations to the computer

Understanding and style of work

1. How the computer works, internal working:
   a. Particular machine, technical view.
   b. General view.

2. What do they think they need to know?
   vs. like to know? vs. know now?

3. Did they create special files that help them
   manipulate software or input/output? easier to
   operate, changes from original setup?

4. do they understand the mechanics

5. Readings: Books, magazines, specific articles?

6. Programming?

   a. What language?
   b. Assembler and machine languages?
   c. Are there any languages they know but don't work with--including assembler and machine languages--why?

7. what kind of software do they have and why?

8. Perceived complexity - what and why?

9. Blaming the machine, seeing it as autonomous entity?

Images - symbolic meanings

1. The machine as a tool: for particular tasks or generalized?

2. servant?

3. Humans as computers?

4. Anthropomorphization?

5. Magic?

6. What else?

Feelings, emotions

1. Frustrations?

2. mastery, control?

3. Challenge?

4. anxiety?

6. Pleasure?

7. Competence?

8. What else?

D. User Types

1. Why vs. how; theoretical vs. practical?

2. Control: mastery of the machine?

3. Mechanic vs. organic?

4. "It" is more important, any use should fit what is best for the machine: Human vs. computer time?

5. Know only what needed for specific use vs. know as much as possible?

6. Trial and error vs. systematic work?

7. Try again and again the same thing that did not work before (the machine as autonomous entity)

9. Like the mechanical part:

   a. How much time is spend on hardware?
   b. what hardware they have, and what they use it for?

E. Interpersonal relationships

1. Do they want to know any other users?

   a. organized interaction - Bulletin Boards, user groups?
   b. Family?
   c. Informal, friends

2. Exchange:

   a. help received - what kind of help? From whom? At what stage (decision, opening, etc.)? Do they depend on someone for complicated things?

   b. Help given - To whom (in return or different people)? What kind of help? Why help? Attitudes toward novices?

IN THE END: ARE THERE ANY QUESTIONS THEY FIND INTERESTING WHICH WERE LEFT OUT?

APPENDIX C

The Hard Copy Version of the Computerized Questionnaire Center for Social Research, CUNY (c)

To the reader: this questionnaire is intended for computer use. Questions are displayed on a computer screen of 24 lines. The screen changes for each question. Screen changes are shown here by means of:

When the same anchoring points are used, such as:

NO!	no	???	yes	YES!
(1)	(2)	(3)	(4)	(5)

The words which apply to the anchoring points such as:

Too expensive
Too difficult to use
Not sure which one to purchase

are flashed on the screen while the anchoring points remain the same. The questionnaire now follows as it would appear on the screen.

Now to the questionnaire itself which is presented more or less as it would appear on a computer screen.

SECTION: INTRODUCTION

The survey you are about to complete is divided into the following sections:

GETTING YOUR COMPUTER
ADVANTAGES AND DISADVANTAGES
SOFTWARE AND HARDWARE
USING YOUR PERSONAL COMPUTER
GIVING HELP AND GETTING HELP WITH YOUR COMPUTER
PERSONAL EXPERIENCES WITH YOUR COMPUTER
ABOUT YOU

Directions for answering each question will be shown at the bottom of each screen. In most cases, you will only have to press the number of your answer (using the numbers at the top of the keyboard). In some cases you will have to press return after typing your answer. Some answers cannot be changed most can be changed.

While the introduction screens are being displayed, we load in the questionnaire. Fast readers please wait a bit for us to catch up with you.

Changing an answer is very easy. You don't have to remember anything. The help line at the bottom of each screen will show you how to enter our editor and:

1 - Erase all the answers on the screen so you can enter new ones.
2 - Go backwards one screen at a time. Your old answer will be shown.
3 - Move ahead, one screen at a time, from a screen just reviewed to following screens until you reach the screen where you had left off.
4 - Go directly to the beginning of a section you have already completed or are now working on.
5 - Go right back to where you were before you entered the editor.
6 - Stop the survey at any point (when the Lottery calls to say you have won 40 million dollars) and return at a later time.

If there is more than one question on the screen, you can use the UP and LEFT cursor control keys to go to the previous question and change your answer. The RIGHT key or RETURN take you to the next question on the screen.

If for some reason you have to quit in the middle of the questionnaire and you remain within DOS, you may start up again by typing START.

When you finish this questionnaire you will be instructed to "download" some programs - our gift to you. Then send your disk back to us. We will return in about another six months to see how you are doing. Finally, we will return this disk to you for you to keep. On the disk will be our final report to users so you can share our discoveries.

Remember that your responses are kept in
complete confidence
in accordance with the policies of
the Committee on Human Subjects of the
Graduate Center of the City University of New York.

SECTION 1
GETTING YOUR COMPUTER

1. Do you or your family own a personal computer?

if yes skip to 2. "what PC"
1. YES
2. NO

Do you or your family own any
IBM or Compatible
computer(s)?

1. Yes
2. No

Model	Date purchased
_____	_____
_____	_____
_____	_____

Please type model and date on line.
Press Enter after each answer, press Enter when you do not have anything to add

---

Do you or your family own any
Macintosh
computer(s)?

1. Yes
2. No

Model	Date purchased
_____	_____
_____	_____
_____	_____

Please type model and date on line.
Press Enter after each answer, press Enter when you do not have anything to add

---

Do you or your family own any
Other
computer(s)?

1. Yes
2. No

Model	Date purchased
_____	_____
_____	_____
_____	_____

Please type model and date on line.
Press Enter after each answer. press Enter when you do not have anything to add

---

You may have access to or own more than one type of microcomputer - between the IBM (or compatible) and the Macintosh:

Which computer do you use the most?

1.IBM or Compatible

2.Macintosh

---

2. In what personal computer have you inserted this disk?

Manufacturer _____ Model _____

---

3. Is the computer you are now using owned by:

1.You
2.Your business
3.Another member of your family- Who? _____
4.Your school - Which? _____
5.A friend
6.Other - Who? _____

The rest of the questionnaire is about your:

IBM or Compatible :: Macintosh

(alternative picked up from question, "Which computer do you use the most?")

4. How did you acquire this computer?

1.I bought it

2.Discount through school/work

I don't own it:

3. My business or school bought it

4.Other. What? _____

---

5. Overall, how satisfied are you with this personal computer?

extremely dissatisfied						extremely satisfied
(1)	(2)	(3)	(4)	(5)	(6)	(7)

Use the scale to select the answer which best reflects your experience

---

6. Are you the main user of this computer?

(If no, go to next question)

1.YES

2.NO

Who is the main user? _____

---

7. Do you use any other personal computers?

(If yes, go to next question)

1.YES

2.NO

Manufacturer	Model
_____	_____
_____	_____
_____	_____

Please type the manufacturer and model of other computers used on the lines provided. Press Enter after each answer, press Enter when you do not have anything to add

---

8. Where do you use personal computers?
(Think about all the computers you use)

(New screen for each place used)

At work
At school
At a friend's house
At home

1.YES

2.NO

---

9. Do you use any mainframe computers?

(If yes, go to next two questions)

1.YES

2.NO

Manufacturer	Model	Location

Please type the manufacturer, model and location of mainframes used. Press Enter after each answer, press Enter when you do not have anything to add

---

Do you access this(these) mainframe(s) by means of your pc?

1.Often

2.Occasionally

3.Never

---

10. How long ago did you first use (Mainframe, if applicable PC for all respondents)

1) 0-6 months
2) 7-11 months
3) 1-2 years
4) 2-4 years
5) 5-6 years
6) 7-10 years
7) more than 10 years

---

11. When (if ever) did you first give serious thought to acquiring a personal computer? (PRESS ENTER IF "NEVER") (If "never" skip next question)

_____ Year

_____ Month (approximate)

---

12. When you were thinking about buying a computer, about how much effort did you put into getting information about computers?

None						A Great Deal
(1)	(2)	(3)	(4)	(5)	(6)	(7)

Use the scale to select the answer which corresponds to your experience

---

(The next two questions are asked for computer owners only)

13. Which of the following was the

most important
next most important
third most important

source of information in your decision to buy this computer and associated software?

1. Books
2. Computer magazines
3. Advertisements
4. Friends
5. People at work
6. Your children in school
7. Other members of the family
8. Computer specialists you know (programmers, engineers, instructors)
9. Computer stores: Which? _____

---

14. Which of the following was the

most important
next most important
third most important

(new screen for each of the above)

reason you bought this personal computer?

(If didn't buy, skip Q 15)

1. I have the same or compatible one at work
2. I like the way it is designed
3. I read a good evaluation of it
4. A friend recommended it
5. It had the software I needed
6. It was reasonably priced
7. I was comfortable with the company's reputation
8. Other. What? _____
9. Not appropriate I did not buy it.

---

15. Where did you buy your computer?

1. Full service computer store - Which? _____
2. Mail order
3. Discount computer store - Which? _____
4. Manufacturer's retail outlet
5. Electronics/camera equipment store - Which? _____
6. Electronics section of department store - Which? ___
7. Other. Where? _____

SECTION 2
ADVANTAGES AND DISADVANTAGES

1. Here are some reasons why people DON'T buy personal computers. Were/are any of these true for you ?

(New screen for each reason)

Too expensive
Too difficult to use
Not sure which one to purchase
Couldn't get enough help from sales people
Couldn't decide which store to go to
Needed more information
Not sure really needed it
Better to wait for newer and better models
Inadequate software
Computers made me feel incompetent
Other (PRESS ENTER IF NO OTHER):

NO!	no	???	yes	YES!
(1)	(2)	(3)	(4)	(5)

Here are the reasons which you have indicated WERE true for you. Which of these was MOST IMPORTANT?

(Reasons checked 4 or 5 are displayed, respondent enters the number of the most important reason)

(LIST OF REASONS HERE)

---

2. Here are some uses for personal computers.
Which are important to you?
(New screen for each reason)

Finances
Banking
Communicating with other users
Word processing
Writing programs
Children's education (NO! if N/A)
Games
Tracking investments
Accounting (spreadsheets, ledgers, etc.)
Mathematical or scientific work
Graphics/Art
Accessing data bases
Keeping records or managing information
Learning programming
Other (PRESS ENTER IF NO OTHER):

NO!	no	???	yes	YES!
(1)	(2)	(3)	(4)	(5)

Here are the reasons which you have indicated WERE important for you. Which of these was MOST IMPORTANT?
(Reasons checked 4 or 5 are displayed, respondent enters the number of the most important reason)

(LIST OF REASONS HERE)

---

3. What do you think the computer can do for you?
(New screen for each function)

Make my life easier
Improve my mind
Be a lot of fun
Help me with my work
Keep me abreast of the modern world
Give me a sense of accomplishment
Give me more job opportunities
Give me social recognition
Improve my knowledge of computers
Help my children (NO! if N/A)
Make things more convenient
Other (PRESS ENTER IF NO OTHER):

NO!	no	???	yes	YES!
(1)	(2)	(3)	(4)	(5)

Here are the things which you have said the computer CAN do for you. Which of these is MOST IMPORTANT?

(Functions checked 4 or 5 are displayed, respondent enters
the number of the most important function)

(LIST OF FUNCTIONS HERE)

SECTION 3
SOFTWARE AND HARDWARE

1. How did you acquire software at the time you purchased your computer?

(New screen for each alternative)

I bought it
The computer came with software
I got software from friends

1.YES

2.NO

---

2. What software do you have?

_____
_____
_____
_____
_____
_____

Type the names of the packages you most often use. Press Enter after each. Press Enter when you do not have anything to add

---

3. Please type in your most frequently used software.

(Save name for next question)

_____

Press enter after you have entered the name of your software.

---

4. Please rate
(Name of package saved above)
on the following:
(New screen for each rating)

ease of learning

Very difficult — Very easy

ease of using (once you have basically learned it)

Very difficult — Very easy

reliability when running

Very unreliable — Very reliable

satisfaction with the manual and other documentation

Very dissatisfied — Very satisfied

OVERALL satisfaction

Very dissatisfied — Very satisfied

(1) (2) (3) (4) (5) (6) (7)

---

6. Have you bought any additional or peripheral equipment
for your computer?
(If Yes, ask next question)

1. Yes

2. No

---

7. What equipment or hardware do you own?

Type of Equipment	Brand or Manufacturer
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Type in names. Press Enter after each. Press Enter when you finish.

---

8. How much money do you now expect to spend on hardware over the next year? (Make your best guess we realize your plans may not be set.)

(If 0, do not ask next question)

1. $0
2. $1-250
3. $251-500
4. $501-1000
5. More than $1000

---

9. Where do you intend to buy this hardware?

_____
_____

Type in the name and/or the kind of place, eg XYZ mail order, or ABC computer store. Then press Enter.

---

10. How much do expect to spend on software over the next year?

1. $0
2. $1-250
3. $251-500
4. $501-1000
5. More than $1000

---

11. Where do you generally get your software?

1. Full service computer store - Which? _____
2. Mail order
3. Discount computer store - Which? _____
4. Manufacturer's retail outlet
5. Electronics/camera equipment store - Which_____
6. Electronics section of department store - Which?_____
7. Write own programs
8. Computer magazine articles
9. Trade with friends
10. Computer clubs or users' groups
11. Other _____

(Press return after making your choice)

If you were advising someone on what computer to buy, how likely are you to recommend your computer?

UNLIKELY				LIKELY
(1)	(2)	(3)	(4)	(5)

---

12. In any case, how likely are you to buy from your manufacturer again?

UNLIKELY				LIKELY
(1)	(2)	(3)	(4)	(5)

SECTION 4
USING YOUR PERSONAL COMPUTER

1. Many people borrow software from friends or acquaintances. About what proportion of your software has been borrowed?

1. Almost none
2. About 25%
3. About 50%
4. About 75%
5. Almost all

The rewards of using this computer have been:

MUCH LESS THAN EXPECTED				MUCH GREATER THAN EXPECTED
(1)	(2)	(3)	(4)	(5)

The problems associated with using this computer have been:

MUCH LESS THAN EXPECTED				MUCH GREATER THAN EXPECTED
(1)	(2)	(3)	(4)	(5)

---

4. About how many hours PER WEEK on average, did you use your personal computer during the past month?

1. 0-1 hours
2. 2-4 hours
3. 5-10 hours
4. 11-20 hours
5. 21-30 hours
6. 31-40 hours
7. More than 41 hours

---

5. Choose the statement that most closely reflects your views about the passage of time while working on your personal computer.

1. Time passes more quickly than usual

2. Time passes just as usual

3. Time passes more slowly than usual

---

6. Now that you use a computer, do you spend more or less time on the following activities?

(New screen for each activity)

Television
Meeting friends
Reading
Time with your family
Sleeping
Work or school work
Work around the house
Going out
Sports and exercise
Family budget
Other (PRESS ENTER IF NO OTHER):

_____
Hobbies:
_____

A lot less (1)	Somewhat less (2)	??? (3)	Somewhat more (4)	A lot more (5)

---

8. About what proportion of your use of your personal computer is related to your work?
(If almost none, skip to question 10)

1. Almost none
2. About 25%
3. About 50%
4. About 75%
5. Almost all
6. All of it, I use it on the job

Do you:

(New screen for each use)

Work on your computer on things which are part of your regular job?

Use your computer in connection with part-time work in addition to your regular job?

Use your computer in connection with your own full-time business

Use your computer in connection with school-related work?

1. YES
2. NO

What kind of computer related work do you do?
(Try to be specific)

_____

Please type your answer and then press Enter

---

9. Have you earned any extra money using your personal computer? (other than your full-time job)

1. No
2. Yes, some
3. Yes, quite a bit

---

10. Have you recently read any books about computing or computers?

(If No, skip to question 11)

1. YES
2. NO

Could you write in the names of one or more books you read recently?

_____

_____

_____

Please type your answer and then press Enter
press Enter when you have nothing more to add

---

11. Which magazines about computing or computers do you regularly read?
(New screen for each magazine)

PC
PC World
Byte
Info world
Mac World
Computing Bulletin
Personal computing
Modern computing
Reset
Newsletters: Which?

_____

Other (PRESS ENTER IF NO OTHER):

_____

1. YES
2. NO

---

12. Have you customized, personalized, modified, or written macros for any programs or operating system characteristics on any computer?

1. YES
2. NO

---

13. Can you program in any computer language?

(If No, skip to question 14)

1. YES
2. NO

Please indicate the three (3) computer languages which you use most frequently to do your programming

_____

_____

_____

Which do you prefer using? _____

Please type your answer and then press Enter
press Enter when you have nothing more to add

---

14. Do you belong to any computer user groups?

(If No, skip to Question 15)

1. YES
2. NO

Please write the name(s) of the group(s) to which you belong.

_____

_____

Please type your answer and then press Enter
press Enter when you have nothing more to add

---

15. Do you own or use a modem?

(If No, skip to question 18)

1. YES
2. NO

---

16. Do you use any Bulletin boards?

(If No, skip to question 17)

1. YES
2. NO

Please write the names of the Bulletin Boards that you use.

_____

_____

Please type your answer and then press Enter
press Enter when you have nothing more to add

About how many hours in the past month did you spend communicating on Bulletin Boards?

1. 0-1 hours
2. 2-4 hours
3. 5-10 hours
4. 11-20 hours
5. More than 21 hours

---

17. Do you use any data bases?

(If No, skip to question 18)
1. YES
2. NO

Please write the names of the data bases that you use.

_____

_____

Please type your answer and then press Enter
press Enter when you have nothing more to add

---

18. How would you best describe your current computer expertise?

1. Complete beginner
2. Novice - still much to learn
3. Intermediate user - fairly knowledgeable
4. Advanced user - very knowledgeable
5. Computer pro - extremely knowledgeable

---

19. Do you consider yourself a "Hacker"?

1. Yes
2. No
3. Don't even know what the hell it means!

---

20. Here are some words people have used to describe computers. To what extent do YOU think they apply to computers?

(New screen for each word)

Limited
Servant
Toy
Tool
Friend
Predictable
Magic
Thinker
Useless
Partner

NO!	no	???	yes	YES!
(1)	(2)	(3)	(4)	(5)

SECTION 5
GIVING AND GETTING HELP

1. When you have problems using your computer, about how often do you solve them in one of the following ways?

(New screen for each method)

On line help
Help from manuals
Help from books
Leave and try again later
Get help from a friend/relative
Call the dealer
Call the software manufacturer
Ask in a users' group meeting
Take a course
Other (PRESS ENTER IF NO OTHER):

_____

Never	Very rarely	rarely	Frequently	Very frequently
(1)	(2)	(3)	(4)	(5)

---

2. The last time you had problems working with your personal computer, was it because:

(New screen for each problem)

You didn't understand what to do
You made a careless error
The documentation wasn't clear
There was a bug which was not your fault
Somehow, this computer seems to have it in for you

1. YES
2. NO

SECTION:
NETWORKS

You are about to enter a special section... Although you may NOT enter the editor from within this section, you can use the left and up arrows to correct answers which are still on the screen.

We are interested in how people get help in general and how they get get help with their computers. We will ask you for the names, addresses and phone numbers of some of the people whom you help or who help you. Some of those may be the same people, some may be different ones. This information will be entirely confidential, but we may also send a disk questionnaire to some of the people you have mentioned.

THEY WILL NOT KNOW ANY OF YOUR ANSWERS TO THIS QUESTIONNAIRE. NO ONE WILL!

In contacting these people, may we use your name?

1. YES
2. NO

Now for a moment, let's talk about something besides computers. From time to time, most people discuss important matters with other people. Looking back over the last six months, who are the people with whom you discussed an important personal matter?
NATURALLY, ALL THESE ANSWERS ARE CONFIDENTIAL.

Name:_____

Phone Number:_____

Address:_____

(Up to Five Names are solicited)

Whom do you ask for advice about computers and computing? (These may have been people you have mentioned before, if so, just type in the number corresponding to their name.

Name:_____

Phone Number:_____

Address:_____

(Up to Five Names are solicited)

Whom do YOU help with computers and computing? (These may have been people you have mentioned before, if so, just type in the number corresponding to their name)

Name:_____

Phone Number:_____

Address:_____

(Up to Five Names are solicited)

Does --
Persons Named Above, New Screen for Each Person

have a personal computer like yours?

1. No, does not have a personal computer.
2. Has a computer, but not like mine.
3. Has a computer somewhat like mine.
4. Has a computer very much like mine.
5. Don't know.

Does --
Persons Named Above, New Screen for Each Person

have computer software like yours?

1. No, does not have a personal computer.
2. Has software different from mine.
3. Has software somewhat like mine.
4. Has software very much like mine.
5. Don't know.

Is --

Persons Named Above, New Screen for Each Person
your:

1. Husband or wife
2. Partner
3. Daughter
4. Son
5. Father
6. Mother
7. Brother
8. Sister
9. Other relative
10. Friend
11. Neighbor
12. Co-worker
13. Professional
14. Consultant
15. Member of user group

(Press return after you have given your answer)

Is --

Persons Named Above, New Screen for Each Person

1. Male
2. Female

About how old is --

Persons Named Above, New Screen for Each Person

—

About how many years have you known --

Persons Named Above, New Screen for Each Person

1. Less than three
2. Three to six
3. More than six
4. Don't know

What is the occupation of --

Persons Named Above, New Screen for Each Person

Try to be as specific as you can press return when you are done

---

About how often do you see or contact --

Persons Named Above, New Screen for Each Person

1. Daily
2. Weekly
3. Monthly
4. Less often
5. Don't know

Does --

Persons Named Above, New Screen for Each Person

live:

1. In the neighborhood
2. In the same city or town (or within one hour's drive)
3. Further away
4. Don't know

How close or tight would you say you are with --

Persons Named Above, New Screen for Each Person

1. Very close
2. Quite close
3. Not very close
4. Not close
5. Not sure

(The screen below is shown for the case in which nine persons in total were mentioned in answering the three questions : with whom you discuss personal problems, who helps you with computers and whom you help with computers (Up to 15 names are possible.)

PERSON NUMBERS

	2	3	4	5	6	7	8	9
1) A	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
2) B	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
3) C	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
4) D	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
5) E	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
6) F	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
7) G	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
8) H	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
9) I								

HERE IS A LIST OF PEOPLE YOU HAVE MENTIONED. WE NEED TO KNOW WHO KNOWS WHOM AND WHETHER THE TWO PEOPLE ARE VERY CLOSE (V), CLOSE (C), OR STRANGERS (S). TYPE (D) IF YOU DON'T KNOW. PLACE THE APPROPRIATE LETTER IN THE APPROPRIATE BOX. HIT THE BACK-SPACE KEY TO CORRECT YOUR LAST ANSWER.

SECTION 6
PERSONAL EXPERIENCES

1. When I am using the computer I feel --

(New Screen for pair of words)

Ambitious				**Lazy**
Imaginative				**Dull**
Incompetent				**Competent**
Dependent				**Independent**
High				**Depressed**
Productive				**Unproductive**
Anxious				**Relaxed**
Frustrated				**Satisfied**
Rational				**Emotional**
Playful				**Serious**
Challenged				**Bored**
Helpless				**In control**
Human				**Dehumanized**
(1)	(2)	(3)	(4)	(5)

---

2. When you work on your personal computer do you prefer:

Knowing only what you need to get things done				Knowing as much as possible
(1)	(2)	(3)	(4)	(5)

---

3. How important is it for you to know the following?
(New screen for each item of knowledge)

How to write application programs
How to program in a high level language
How to program in assembler or machine language
Computer science theory
Mathematics and logic of computing
Artificial Intelligence
Solid state electronics
How computer hardware works
How to make simple repairs on computers

Not Important				Very Important
(1)	(2)	(3)	(4)	(5)

---

5. Here are some things people have said about their experiences with the computer. Please indicate how much you agree or disagree.
(New screen for each statement)

It is more important actually to try things out on the computer rather than to read the manuals.

This computer is not suitable for the use I intended.

Improvising is an essential part of working with computers.

The available software does not match my needs.

This computer has taken up too much of my time.

I always try to document what I do on the computer.

There is a lot of similarity between the way computers work and the way people think.

The people who sold me this computer have not been helpful.

It has been difficult to learn to use this computer.

Disagree				Agree
(1)	(2)	(3)	(4)	(5)

---

6. Please read carefully each of the following statements and indicate how much you agree or disagree.
FOR THIS QUESTION YOU WILL NOT BE ABLE TO CHANGE YOUR ANSWERS

(New screen for each statement)

When I get what I want it's usually because I worked hard for it.

I find it easy to play an important part in most group situations.

When I make plans I am almost certain to make them work.

I prefer games involving some luck over games requiring pure skill.

I can learn almost anything if I set my mind to it.

When being interviewed I can usually steer the interviewer toward the topics I want to talk about and away from those I wish to avoid.

My major accomplishments are entirely due to my hard work and ability.

I usually don't set goals because
I have a hard time following through on them.

If I need help in carrying off a plan of mine,
it's usually difficult to get others to help.

If there's someone I want to meet I can usually arrange it.

Competition discourages excellence.

Often people get ahead just by being lucky.

On any sort of exam or competition I like to know how well I do relative to everyone else.

Even when I'm feeling self-confident about most things, I still seem to lack the ability to control social situations.

I have no trouble making and keeping friends.

It's pointless to keep working on something that's too difficult for me.

I'm not good at guiding the course of a conversation with several others

I can usually establish a close personal relationship with someone I find attractive.

I often find it hard to get my point of view across to others.

In attempting to smooth over a disagreement I usually make it worse.

Disagree				Agree
(1)	(2)	3)	(4)	(5)

SECTION 7
ABOUT YOURSELF

1. Are you:

1. Male

2. Female

---

2. What is the highest level of education you have attained?

1. Some high school or less
2. High school graduate
3. Some college
4. College graduate
5. Master's degree
6. Ph.D. or professional degree

---

3. How old were you on your last birthday?

_____

---

4. What is your total household annual income, before taxes?

1. Less than $15,000
2. $15,000 - $19,999
3. $20,000 - $29,999
4. $30,000 - $39,999
5. $40,000 - $49,999
6. $50,000 - $64,999
7. $65,000 or more

---

5. What is your occupation? (please try to be specific, (e.g.) High school teacher of mathematics, Automobile transmission repairman)

_____

_____

Please type your answer and then press Enter
press Enter when you have nothing more to add

---

6. Please indicate your ethnic status

1. Black
2. White
3. Hispanic
4. Other _____

---

7. Do you live alone?

(If yes, skip to question 9)

1. Yes

2. No

---

8. Please list the other members of your household (son, daughter, spouse, etc.), their age on their last birthday, and how much they use computers (None, little, moderate, a lot)

Household member	Age	Computer use: None (1)	Little (2)	Moderate (3)	A lot (4)
_____	__			_	
_____	__			_	
_____	__			_	
_____	__			_	

Please type your answer and then press Enter
press Enter when you have nothing more to add

---

9. Without looking at your watch, please give us your best estimate for how long you have been working on this questionnaire.

About _____ minutes

BIBLIOGRAPHY

Anderson, R. E. (Ed.). (1986). Topics in computer education: National educational, computer policy alternatives (ISBN-0-89791-188-1). New York: ACM.

Baum, A., & Singer, J. E. (1980). Advances in environmental psychology: (Vol. 2.) applications of personal control. Hillsdale, NJ: Lawrence Erlbaum Associates.

Becker, H. J. (1985). How schools use microcomputers: Results from a national survey. In M. Chen & W. Paisley (Eds.), Children and microcomputers. Beverly Hills, CA: Sage.

Bell, D. (1973). The coming of post-industrial society. New York: Basic Books.

Bell, D. (1980). The social framework of the information society. In M. L. Dermouzos, & J. Moses (Eds.), The computer age: A twenty-year view. Cambridge, MA: MIT Press.

Bolter, D. J. (1984). Turing's man. Chapel Hill: University of North Carolina Press.

Braverman, H. (1974). Labor and monopoly capital : The degradation of work in the twentieth century. New York: Monthly Review.

Bunnel, D. (1985, January). Surveying the PC Marketplace PC World, pp. 11

Calhoun, C. J. (1981). The microcomputer revolution? Sociological Methods and Research, 9, 397-437.

Capini, M. D., & Sigelman L. (1986). Do Yuppies matter? Competing explanations of their political distinctiveness. Public Opinion Quarterly, 50, 502-518.

Caporael, L. R. (1984). Computers, prophecy, and experience: A historical perspective. Journal of Social Issues, 40(3), 15-29.

Caporael, L. R., & Thorngate, W. (1984). Introduction: Towards the social psychology of computing. Journal of Social Issues, 40(3), 1-14.

Cathcart, R., & Gumpert, C. (1983). Mediated interpersonal communication: Toward a new technology. Quarterly Journal of Speech, 69, 267-277.

Chen, M. (1985). A macro-focus on microcomputers: Eight utilization and effects issues. In M. Chen & W. Paisley (Eds.), Children and microcomputers. Beverly Hills, CA: Sage.

Chen, M., & Paisley, W. (Eds.). (1985). Children and microcomputers. Beverly Hills, CA: Sage.

Clements, D. H. (1986). Effects of LOGO and CAI environments on cognition and creativity. Journal of Educational Psychology, 78(4), 309-318.

Community Service Society of New York. (1984, July). Computers in the School: The new frontier Report published by CSS.

Coovert, M. D., & Goldstein, M. (1980). Locus of control as a predictor of users' attitude toward computers. Psychological Reports, 47, 1167-1173.

Csikszentmihalyi, M., & Rochberg-Halton, E. (1981). The meaning of things. Cambridge, MA: University Press.

Dickerson, M. D., & Gentry, J. W. (1983). Characteristics of adopters and non-adopters of home computers. Journal of Consumer Research, 10, 225-235.

Deaux, K. (1985). Sex and gender. Annual Review of Psychology, 36, 49-81.

Ellul, J. (1964). The technological society. New York: Knopf.

Ellul, J. (1980). The technological system. New York: Continuuim.

Elwork, A., & Gutkin, T. B. (1985). The behavioral sciences in the computer age. Computers in Human Behavior, 1, 3-18.

Evans, B. O. (1980). Computers and communications. In M. L. Dermouzos, & J. Moses (Eds.), The computer age: A twenty-year view. Cambridge, MA: MIT Press.

Falbo, T., & Peplau, L. A. (1980). Power strategies in intimate relationships. Journal of Personality and Social Psychology, 38, 618-628.

Giacquinta, J., Ely, M., & Smith-Bruke, T. (1984, Sep). Micro computing at home: A comparative analysis of 20 families. New York: New York. University, SITE.

George, F. H. (1977). Machine takeover: The growing threat to human freedom in a computer controlled society. New York: Pergamon Press.

Gotlieb, C. C., & Borodin, A. (1973). Social issues in computing. New York: Academic Press.

Gottlieb, D., & Dede, C. (1983). The social role of personal computers, implications for familial mental health. Unpublished manuscript. University of Houston, College of Social science, Texas.

Goyder, J. (1985). face-to face interviews and mailed questionnaires: The net difference in response rate. Public Opinion Quarterly, 49, 234-252.

Green, T. R. G., Payne, S. J., & Van der Veer, C. G. (1983). The psychology of computer use. London: Academic Press.

Guiliano, V. (1982). The mechanization of office work. Scientific American, 247, 148-165.

Henley, N. M. (1977). Body politics: Power, sex, and nonverbal communication. Englewood Cliffs, NJ: Prentice-Hall.

Hiltz, S. R., & Turoff, M. (1978). The network nation. Reading, MA: Addison-Wesley.

Hiltz, S. R. (1983). Viewing computing systems within a social context. Invited paper on "Computers and everyday life", IFIP, Paris.

Holden, C. (1984, July 20). Will home computers transform schools? Science, 225, 296.

Horwitz, J. (1986). Working at home and being at home: interaction of microcomputers and the social life of households. Unpublished doctoral dissertation, CUNY, The Graduate School, New York.

How our readers are using their computers. (1983, Sep). Consumer Report, pp. 470-473.

Hunt, A. H., & Hunt, T. L. (1986). Clerical employment and technological change: A review of recent trends and projections (Research report No. 86-14). Washington, DC: National Commission for Employment Policy.

Johnson, P. (1976). Women and power: Toward a theory of effectiveness. Journal of Social Issues, 32(3), 99-110.

Kay, A. (1984). Computer software. Scientific America, 251, 52-59.

King, J. L., & Kraemer K. (1980). Cost as a social impact of telecommunication and other information technologies. Irvine, CA: Public Policy Research.

Klieman, G. (1984). Brave new schools: How computers can change education. Reston, VA: Reston.

Kiesler S., & Sproull, L. S. (1986). Response effects in the electronic survey. Public Opinion Quarterly, 50, 402-413.

Kling, R. (1980). Social analysis of computing: Theoretical perspective in recent empirical research. Computing Surveys, 12, 61-110.

Kling, R., & Scacchi, W. (1982). The web of computing: Computer technology as social organization. Advances in Computing, 21, 1-90.

Kling, R., & Iacono S. (1984). Computing as an occasion for social control. Journal of Social Issues, 40, 77-97.

Kraut R. (Ed.). (1986). Technology and the transformation of white collar work. New Jersey: Lawrence Erlbaum.

Kroger, J. J. (1984). Breakthrough year for computers. Marketing Communications, 9(4), 64.

Langer, E. J. (1983). The Psychology of Control. Beverly Hills, CA: Sage.

Lee, R. B. (1984, March). The social cultural implications of the microrevolution. Paper presented at the meeting of American Marketing Association, Attitude research conference.

Lee R. S. (1970). Social attitudes and the computer revolution. Public Opinion Quarterly, 34, 53-59.

Lefcourt, H. M. (1981). Research with the Locus of control construct, Vol I. NY: Academic Press.

Lefcourt, H. M. (1982). Locus of Control. Hillsdale, NJ: Lawrence Erlbaum Associates.

Lepper, M. R. (1985). Microcomputers in education: Motivational and social issues. American Psychologist, 40, 1-18.

Lemmons, P. (1981, Oct). The IBM personal computer - first impressions Byte, pp. 16-17.

Levenson, H. (1981). Differentiating among internally, powerful others, and chance. In H. M. Lefcourt (Ed.), Research with the Locus of control construct, Vol I. NY: Academic Press.

Levy, S. (1984). Hackers. Anchor Press/Doubleday.

Lewis P. H. (1987, April 7). A new Path for I.B.M. The New York Times, p. C8.

Lieberman, D. (1985). Research on children and microcomputers: A review of utilizations and effects studies. In M. Chen & W. Paisley (Eds.), Children and microcomputers. Beverly Hills, CA: Sage.

Lucky, R. W. (1984). The social impact of the computer. In H. R., Pagels (Ed.), Computer culture: The scientific, intellectual, and social impact of the computer. New York: The New York Academy of Sciences.

MacHovec, F. (1984, April). Love of the first Byte: A Terminal affair. APA monitor, p. 5.

McQuarrie, E. F., Langmeyer, D., & Gleser, G. C. (1984). Using consumer satisfaction to test theories of attitude-behavior consistency: The case of personal computer. Unpublished paper, Uni. of Cincinnati.

Mossberg, W. S. (1986, June 16). Searching for the perfect computer. The Wall street Journal, pp.1, 4, 5.

Mumford, L. (1970). The myth of the machine. New York: Harcourt Brace and World.

Noble, D. (1978). Social choices in machine design. Politics and Society, 8, 313-347.

Nora, S., & Minc, A. (1980, January/February). Computerizing society. Society, pp. 23-30.

Paisley, W. (1985). Children, new media, and microcomputers: Continuities of research. In M. Chen & W. Paisley (Eds.), Children and microcomputers. Beverly Hills, CA: Sage.

Palenzuela, D. L. (1984). Critical evaluation of control: Towards a reconceptualization of the construct and its measurement. Psychological Reports, 54, 683-709.

Papert, S. (1980). Mindstorms. New York: Basic Books.

Paulhus, D., & Christie, D. (1981). Spheres of control: An interactionist approach to assessment of perceived control. In H. M. Lefcourt (Ed.), Research with the Locus of Control construct, Vol I, NY: Academic Press, pp. 161-188.

Paulhus, D. (1983). Sphere-specific measures of perceived control. Journal of Personality and Social Psychology, 44(6), 1253-1265.

Pea, R. D., Kurland, M., & Hawkins, J. (1985). LOGO and the development of thinking skills. In M. Chen & W. Paisley (Eds.), Children and microcomputers. Beverly Hills, CA: Sage.

Perrolle, J. A. (1983, August). Computer generated social problems. Paper presented to the SSSP in Detroit.

Piesman, M., & Hartley M. (1984). The Yuppie handbook: The state-of-the-art manual for young urban professionals. New York: Long Shadow Books.

Pool, I. (1983, Aug). Tracking the flow of information. Science, 221, 609-613.

Qualline, C. M. (1984, June). The computer -- a sociological time bomb. Paper presented at a conference on the social effects of computers in the University of Rochester, New York.

Reid, D. W., & Ware, E. E. (1973). Multidimensionality of internal-external control: Implications for past and future research. Canadian Journal of Behavioral Science, 5, 264-271.

Rosenberg, R. S. (1986). Computers and the information society. New York: Wiley & Sons.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 80, (1, Whole no.609).

Schools' use of computers disappointing. (1984, Dec 9). New York Times, pp. 1, 80.

Sheingold, K., Hawkins, J., & Char, C. (1984). "I'm the thinkest, you're the typist": The interaction of technology and the social life of classrooms. Journal of Social issues, 40(3), 49-62.

Simon, H. A. (1977). What computers mean for man and society. Science, 195, 1186-1191.

Simon, H. A. (1980). The consequences of computers for centralization and decentralization. In M. L. Dermouzos, & J. Moses (Eds.), The computer age: A twenty-year view. Cambridge, MA: MIT Press.

Software survey. (1985, Feb) Consumer Report.

Somerson, P. (1984, June 26). Meet John Dough. PC Magazine, p. 85.

Stein, J. S., & Linn, M. C. (1985). Capitalizing on computer-based interactive feedback: An investigation of Rocky's boots. In M. Chen & W. Paisley (Eds.), Children and microcomputers. Beverly Hills, CA: Sage.

Strassman, P. (1985). Information payoff: The transformation of work in the electronic age. New York: Free Press.

Strickland, B. R., & Haley, W. H. (1980). Sex differences on the Rotter I-E Scale. Journal of Personality and Social Research, 39, 930-939.

The BYTE reader: who are you, editorial. (1984, May). Byte, p. 4

Toffler, A. (1980). The third wave. New York: William Morrow.

Turkle, S. (1980, January/February). The computer as Rorschach. Society, pp. 15-24.

Turkle, S. (1984). The second self, computers and the human Spirit. New York: Simon and Schuster.

Veer van der, G. C., & Wolde van der, G. J. E. (1983). Individual differences and aspects of control flow notations. In T. R. G. Green, S. J. Payne, & C. G. van der Veer (Eds.), The psychology of computer use. London: Academic Press.

Watkins, B., & Brimm, D. (1985). The adoption and use of microcomputers in homes and elementary schools. In M. Chen & W. Paisley (Eds.), Children and microcomputers. Beverly Hills, CA: Sage.

Watson, A. (1985, March). Hooked on programming? How to tell if you're a true addict. The DEC Professional, pp. 68-73.

Weizenbaum, J. (1976). Computer power and human reason. San Francisco: W. H. Freeman.

Weizenbaum, J. (1984, June). Another view from MIT. BYTE, pp. 225.

Wilkes J. M. (1984). The hackers challenge: Artistry, addiction or subversion? Paper presented at the ESA annual meeting.

Zoltan, E., & Chapanis, A. (1982). What do professional persons think about computers? Behavior and Information Technology, 1(1), 55-68.