Research

Attitudes toward computers: when do they predict computer use?1

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Abstract

Many people in the MIS field have accepted the idea that attitudes affect the frequency and type of computer use but research has provided inconsistent results. This paper, therefore, explores the conditions under which attitudes can predict computer use, investigating both workers’ volitional control and their knowledge of the technology. Analyses are based on responses of 168 white-collar employees in 77 computer-using work groups. Attitudes were found to predict the number of hours of computer use for all workers, but only predicted the extent of job computerization for those who had real freedom of choice and knowledge about their computer system. © 1998 Elsevier Science B.V. All rights reserved

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1. Introduction

The ongoing debate about the ‘productivity paradox’ is indicative of the pressure on organizations to demonstrate tangible benefits from their deployment of computer technology. One facet of this issue is to understand who uses computers at work and under what circumstances. Attitude theories, as described by social psychologists, are especially relevant. It is commonsense to predict that people who hold favorable attitudes toward computers will use them more than those who hold unfavorable attitudes. While this link appears simple, it has not been consistently validated by empirical research. It is important to test this hypothesis because of its implications for organizations. If there is a link, organizations wishing to increase their workers’ use of computers should focus on improving workers’ attitudes toward computers (e.g. reduce computer anxiety and computer phobia). If favorable attitudes do not predict computer use, then current efforts focusing on improving employees’ attitudes toward computers may be misdirected.

The idea that attitudes might affect the frequency and type of computer use has been considered by...
many MIS researchers (e.g. see Refs. [2, 3, 13, 14]) with equivocal results. Perhaps the inability to show a clear relationship between computer attitudes and use is due to previous studies’ lack of attention to conditions that moderate the relationship between attitudes and behavior. The research questions we address in this paper can be summarized fairly succinctly: to what extent and under what conditions do attitudes toward computers affect computer use?

1.1. Conditions under which attitudes predict computer use

Researchers have concluded that attitudes are not the only (and sometimes not even the most important) factors predicting behavior, so in many situations a certain amount of inconsistency between attitudes and behavior can be expected [9]. Not surprisingly, in the last two decades, researchers have attempted to specify more complete models of the relationship between attitudes and behavior, and have included a variety of characteristics of the individual or the environment that facilitate acting in a manner consistent with attitudes [15]. In general, research shows that attitudes will not be related to behavior when people are not free to act according to their attitudes. The relationship between attitudes and behavior should be strongest when the individual is capable of performing the behavior, and it is under volitional control.

Employees who have volitional control over their work are freer to act on their attitudes, and so those who have positive attitudes should be more likely to use computers. However, few employees are completely free or unconstrained in their use of computers [5]. A person who can choose to use a computer should describe the computer as a tool, and be freer to act on attitudes held toward computers. A person who says he or she has no choice is not free to act on attitudes held toward computers. We would expect a stronger relationship between attitudes and behavior for professional workers than for clerical workers because, in general, the former are usually granted more control over their work. Some clerical workers (such as telephone operators or some reservations clerks) must use a computer eight hours a day at work [6]. For them, the number of hours spent in computer use is highly constrained and unlikely to be related to employees’ attitudes. In contrast, many professional or managerial workers can choose when and for what tasks to use the computer and may, for example, choose to send a message electronically or to use the telephone. Another aspect of volitional control is the availability of computers; it should, therefore, affect the attitude–behavior relationship.

A second condition that can affect the relationship between attitudes toward computers and computer use is the skill required to perform a behavior [7]. Computer literacy affects the extent to which one can act on one’s attitude about computers, but few researchers have studied its role.

1.2. Computer attitude–behavior relationship

Since we are interested in predicting actual behavior, our literature review will focus on empirical research relating computer attitudes to actual use of computer systems (e.g. see Refs. [8, 10, 11, 12, 14]). Compeau and Higgins, Lucas, Pavri, and Robey all found that positive attitudes toward computers led to increased computer use. Schewe [12] and Thompson et al. [14] found no link between attitudes and computer use. These studies included only knowledge workers and managers who had volitional control over computers, so these contradictory empirical results cannot be explained by differences in the degree of volitional control.

A second aspect of volitional control is access to computers. Only Pavri [10], and Thompson et al. [14], controlled for this moderator by excluding managers and knowledge workers who did not have easy access to computers. Since the other researchers did not expressly report access to computers, it is possible that computers were not equally available to users in the other studies cited above. This may account for some of the inconsistent results.

The range of computer knowledge of users (and, therefore, their skill in using the system) may have also varied across these studies. Both, Robey [11] and Lucas [8] studied salespeople within single organizations in the 1970s; they may have had substantially more knowledge of computers than did the sample of end users from a diverse set of offices studied later by Thompson et al. This difference in the respondents could explain the differences in their results. Both Pavri and Schewe found that there was no direct
relationship between skills or knowledge and computer use, but Pavri found a strong link between positive attitude and computer use, and Schewe found no such link. Though Pavri and Schewe tested a direct causal relationship between knowledge and use, we suggest that knowledge moderates the relationship between attitudes and use. Additionally, neither study used any objective measures of computer literacy, and self-report measures may not be sufficient to determine its effect on attitudes and computer use.

Another explanation for the inconsistent results of these studies is that the measures varied in specificity. Some measured attitudes at a general level (e.g. feelings toward computers in the abstract) and behavior to refer to a specific computer system (e.g. number of hours on own computer). If attitudes and behavior were measured at different levels of specificity, the relationship between them may be attenuated or misleading. A person with positive attitudes toward computers (not targeted toward a specific system), but a negative attitude toward a specific computer system, may respond either positively or negatively to a question about computers in the abstract.

Another aspect of these studies is that the construct ‘attitude toward computers’ was measured in different ways. It is difficult to compare results because each may have been capturing different aspects of the construct.

In summary, we make specific predictions about two types of possible moderators of the attitude–computer use relationship. Specifically, we hypothesize:

\[ H1: \text{Attitudes toward computers will be positively associated with computer use.} \]

\[ H2: \text{In general, the relationship between attitudes and computer use will be stronger when the individual’s behavior toward the computer is less constrained (i.e. the behavior is under volitional control and the individual has the knowledge to perform the behavior).} \]

2. Method

2.1. Sample and procedure

Data for our analyses came from a larger field study of computer-using white-collar workers. Forty-nine different organizations, recruited through personal contact, agreed to participate in our study and provided access to employees in 89 different work groups. This constituted a convenience sample of computer-reliant white-collar workers. It was not possible to draw a stratified random sample, since the characteristics of the parent population are unknown. For each work group, each person received a questionnaire with a cover letter customized for that work group. Questionnaires required about 20 min to complete and measured computer attitude, use, and facilitating conditions. These data were collected in Summer, 1988. In Winter 1989–1990, work group supervisors were contacted and asked to have all employees fill out a second questionnaire that assessed computer literacy. Seventy-seven work groups participated in this data collection. This paper presents analyses based on the responses of the 168 respondents in 77 work groups who answered both questionnaires. Characteristics of this sample are shown in Table 1.

2.2. Measures

2.2.1. Computer use

Computer use was measured in two ways. First, respondents were asked: “On average, how many hours a week do you spend working on a computer for your job?” Only 10% used the computer less than 5 h a week, 16% used it for 5 to 10 h per week, 24% for 10 to 20 h per week, 27% for 20 to 30 h per week, 20% for 30 to 40 h per week, and only 3% used a computer for more than 40 h per week. Second, an index of the intensiveness of computer use was created by calculating the percent of tasks performed in respondents’ jobs which required the use of a computer. Respondents indicated how often they performed 21 common office tasks and whether or not they used a computer in doing them (see Table 2). The number of tasks performed mostly with a computer was calculated and divided by the number of tasks performed frequently. The distribution of this measure departed somewhat from normality; the mean was 54.3%, the median – 57.1%, and the standard deviation – 29.6%. Both hours of use per week and percentage of tasks computerized are commonly used measures of use [1].
2.2.2. Attitudes toward the computer

Three measures were used to evaluate this construct. First was a measure of global satisfaction: “All in all, how satisfied are you with the computer system available to you?” Over one-third of respondents (37%) reported that they were very satisfied with their computer system, 51% reported that they were somewhat satisfied, and 12% reported that they were not too satisfied. Workers were also asked “If you could choose, in your work would you: avoid the computer at all possible costs” (13%) or “prefer to use the computer” (87%). The final measure of attitudes asked “If it were possible in your work, would you: computerize more of your tasks” (88%) or “prefer to delegate computer tasks to someone else” (12%).

2.2.3. Volitional control

Three measures represented volitional control. The first asks: “Are you the only user of your terminal or do you share terminals with other workers?” Forty-six percent of workers shared the terminal with others and 54% had his or her own terminal. Second was: whether the worker was in a job classified as clerical (34%) or non-clerical (66%). Third, respondents indicated whether the computer was a tool to be used at their convenience (62%) or whether their job was to use the computer (38%).

2.2.4. Computer literacy

Measuring the knowledge required to perform the behavior, computer literacy, was assessed using a scale described elsewhere [16]. A description of the instrument and the 23 items making up the scale are shown in Appendix A. In general, questions cut across computer hardware and software applications and tapped both abstract and concrete knowledge. A principal
components factor analysis indicated that a one-factor solution was probably most interpretable [4]. The scale showed good internal consistency (coefficient $\alpha=0.93$) as well as discriminant and convergent validity.

For our study, each item was standardized and, then, all were combined into a single scale. The Cronbach’s $\alpha$-coefficient measuring the internal consistency reliability of the scale was computed for the sample; reliability of the scale was excellent (0.94). Scores on this continuous measure of the ability to use the computer were dichotomized at the mean with 47% of the sample classified as not computer literate and 53% as literate.

Means, standard deviations, and intercorrelations of the predictor and outcome variables are shown in Table 3. All variables were scored such that a higher score indicates a more positive attitude and greater computer use.

Two types of analyses were performed to test the hypotheses: simple correlation and moderated multiple regression. For each of the predicted moderator variables, the sample of respondents was divided into two groups and identical multiple regressions were performed for each group predicting each of two measures of computer use from the three attitude variables described above. The $R^2$ statistic was adjusted for the number of predictors included in the equation in order to more closely approximate the population value.

3. Results

Hypothesis one was supported. The correlation between the three measures of attitude toward the computer and the two measures of computer use ranged from 0.22 to 0.34, showing a modest but significant association between attitude and behavior. Table 4 shows the results of the multiple regression performed on the entire sample regressing each of the two types of computer use on the three measures of computer attitudes. Attitudes were related to both types of behaviors, but were more strongly predictive of hours of work on the computer ($R^2=0.185; p<0.001$) than of extensiveness of computerization ($R^2=0.078; p<0.001$) operationalized as the percent of tasks performed by computer. Hypothesis two received partial support. Table 5 shows the results of four sets of moderated regressions. When respondents were divided into two subsamples on the basis of sharing a terminal and the regressions performed on each group separately, the results were markedly different. Although sharing a terminal did moderate the relationship between attitudes and behaviors, the outcome was the opposite of that predicted. Attitudes accounted for both types of behavior much better for workers who shared terminals (28.9% of the variance accounted for).

Table 3
Means, standard deviations, and intercorrelations among computer attitude and use measures

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Computer attitudes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Avoid Computer</td>
<td>1.87</td>
<td>0.34</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Computerize more tasks</td>
<td>1.88</td>
<td>0.33</td>
<td>0.29$^b$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Global satisfaction</td>
<td>2.25</td>
<td>0.65</td>
<td>0.15</td>
<td>0.18$^a$</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Computer use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Hours of computer use</td>
<td>3.41</td>
<td>1.32</td>
<td>0.34$^b$</td>
<td>0.30$^b$</td>
<td>0.28$^b$</td>
<td></td>
</tr>
<tr>
<td>5. Extensiveness (% of tasks)</td>
<td>0.51</td>
<td>0.27</td>
<td>0.26$^b$</td>
<td>0.25$^b$</td>
<td>0.22$^b$</td>
<td>0.31$^b$</td>
</tr>
</tbody>
</table>

$^a p<0.05.$  
$^b p<0.01.$  

Note: High scores indicate more positive attitudes and greater computer use.

Table 4
Beta weights of predictors from multiple regressions

<table>
<thead>
<tr>
<th></th>
<th>Total sample ($n=168$)</th>
<th>Hours per week</th>
<th>% Computer tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid computer</td>
<td>0.255$^c$</td>
<td>0.167$^a$</td>
<td></td>
</tr>
<tr>
<td>Computerize more tasks</td>
<td>0.189$^b$</td>
<td>0.140</td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>0.207$^b$</td>
<td>0.143</td>
<td></td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.185$^c$</td>
<td>0.078$^c$</td>
<td></td>
</tr>
</tbody>
</table>

$^a p<0.05.$  
$^b p<0.01.$  
$^c p<0.001.$
in hours of use and 23.1% of the variance in extensiveness) than for those who had their own (4.8% of the variance in hours of use and 0.1% of the variance in extensiveness).

Results for the other three moderators were quite different from those for sharing a terminal, and were more consistent with our second hypothesis. When the sample was divided according to job classification, both types of computer use could be predicted from attitudes for non-clerical workers. For clerical workers, hours of use were predicted by attitudes but the extent of computerization was not. Similarly, when the sample was divided according to respondents’ perceptions of the computer as a tool vs. that their job was to use the computer, both types of computer use could be predicted from attitudes for those who felt the computer was a tool. For workers reporting that their job was to use the computer, hours of use were predicted by attitudes, but the extent of computerization was not. The same pattern was found when the sample was divided according to respondents’ computer literacy (knowledge required to use the computer). Both types of computer use could be predicted from attitudes for those who were computer literate. For workers who are not highly computer literate, hours of use were predicted by attitudes, but the extent of computerization was not.

Hypothesis two was supported for three of the four moderators (seeing the computer as a tool, doing clerical work, and being computer literate) when computer use was operationalized as percentage of tasks performed by computer (extensiveness of computerization), but not when use was operationalized as the number of hours per week of computer work. Thus, respondents’ attitudes toward the computer system predicted the number of hours per week that

<table>
<thead>
<tr>
<th>Terms of Service</th>
<th>Hours per week</th>
<th>% Computer tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share (n=71)</td>
<td>Have own (n=83)</td>
</tr>
<tr>
<td>Avoid computer</td>
<td>0.245&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.032</td>
</tr>
<tr>
<td>Computerize more tasks</td>
<td>0.196</td>
<td>0.278&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>0.327&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.011</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.289&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.048</td>
</tr>
<tr>
<td>Clerical job</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoid computer</td>
<td>0.297&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.238&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Computerize more tasks</td>
<td>0.260&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.142</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>0.201</td>
<td>0.264&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.168&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.198&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Computer is tool</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoid computer</td>
<td>0.151</td>
<td>0.270</td>
</tr>
<tr>
<td>Computerize more tasks</td>
<td>0.268&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.212&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>0.277&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.127</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.191&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.159&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Literacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoid computer</td>
<td>0.264&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.331&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Computerize more tasks</td>
<td>0.405&lt;sup&gt;c&lt;/sup&gt;</td>
<td>−0.053</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>0.078</td>
<td>0.320&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.266&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.193&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> p<0.05.  
<sup>b</sup> p<0.01.  
<sup>c</sup> p<0.001.  

Table 5  
Beta weights of predictors from moderated multiple regressions
they used it, regardless of job classification, perception that the computer was a tool, or level of computer literacy; however, this was true only for those who shared their terminal with others. Attitudes were somewhat stronger predictors of the extent of computerization (percent of tasks) for those in non-clerical jobs, those who perceived the computer to be a tool to be used at their convenience, those who were computer literate, and those who shared their computer terminal with others. The pattern of results observed for those sharing terminals compared to those having their own terminal indicated that this moderator did not represent ease of access as originally hypothesized.

4. Discussion and conclusions

Overall, attitudes toward computers did predict computer use, and in some cases the consistency between attitudes and behavior was reasonably strong. For example, responses to three attitude questions together accounted for 18.5% of the variance in number of hours of work on the computer, and among those who share a computer terminal, attitudes accounted for 28.9% of the variance in number of hours of computer use.

The pattern of relationship between attitudes and behavior differed for the two indicators of computer use, suggesting that these two measures of computer use are not interchangeable. Computer use seems to be a multidimensional concept. Regardless of freedom of choice or knowledge, attitudes predicted the number of hours per week that respondents used computers. However, only when there was freedom of choice to use computers or when people had the knowledge required to use them did their attitudes predict the extent to which their jobs were computerized. Perhaps the hours per week that one uses a computer is inherently under greater volitional control than is the percentage of one’s tasks that are computerized.

Attitudes toward computers are an appropriate focus for organizations attempting to increase the number of hours that their employees use their computers and those with the knowledge to use them. Improving workers’ computer literacy and control may enhance the relationship between attitudes and computer use.

Most of the applied research on attitudes has been concerned with the effects of attitude on behavior, and our study is no exception. This direction of prediction is of greater practical interest than the reverse (behavior predicting attitudes) to the extent that one is interested in behavior change (i.e. computer use) and in trying to affect attitude as a way to alter behavior. It should be noted, however, that our study and many others do not directly address the issue of causality. In our study, the measures of attitudes did not precede (in time) the measures of behavior. Without this condition, causality cannot be inferred.

One of our measures, whether or not a worker shares a computer terminal or has his/her own, did not behave as we had expected. We found that the three attitude items were not significantly related to either hours per week at the computer or the percent of tasks performed on a computer for those who had their own terminal, but the relationship between attitude and use was significant for those who shared their terminals. Apparently, among those who shared a terminal, only those with favorable attitudes made the extra effort to spend hours at the computer and to use the computer for a higher proportion of their tasks. Some of the workers who have their own terminal also have little choice in the amount of time they spend on the computer (i.e. 8 h a day) or about the tasks for which they use the computer.

Appendix A

Computer literacy measure

We developed a reliable and valid 23-item measure of functional computer literacy that would be appropriate for computer-using workers with varying levels of sophistication. In preparing questions to be included in our measure, we consulted microcomputer user manuals, items from measures of general computer literacy, items of computer aptitude or other related measures, computer experts and colleagues, and previous surveys and studies. Some of the items were adaptations of questions, items, or statements from manuals and studies and others were written
“from scratch.” A pilot questionnaire was developed, evaluated by independent experts in end-user computing, tested on two local work groups, and altered where required.

Questions cut across hardware and software applications, and tapped both, abstract and concrete knowledge. Though not all items may be relevant to each individual’s current job, the aggregate knowledge represents a set that indicates a worker’s ability to perform a variety of tasks commonly included in white-collar jobs that involve using microcomputer-based systems. We included more than one response format in order to determine whether all four measured the underlying construct equally well. Based on the available literature and consultations with end-user computing experts, items were written or adapted to cover various aspects of computer knowledge.

A principal components factor analysis scree test indicated that a one-factor solution was most interpretable [4]; one factor was extracted that accounted for 38.5% of the variance present in the data; its eigenvalue was 9.23. Though the single factor only accounted for 38.5% of the variance, this indicates that many of the items tapped unique variance, not shared by the other items. The remaining 61.5% of the variance was tapping a portion of the construct that was not covered by other items in the measure.

The 23-item scale showed good internal consistency as well as discriminant and convergent validity in two different samples. Consistent with previous qualitative research, managers and professionals scored higher on our measure than did clerical or secretarial workers ($t_{(575)}=11.86; p<0.001$). In addition, workers who currently used computers scored higher than those who did not ($t_{(575)}=5.62; p<0.001$), those who had programming experience scored higher than workers without it ($t_{(575)}=22.45; p<0.001$), and those who had been working with computers for a longer time scored higher than short-time users ($r=0.46; p<0.0001$). Computer literacy and age within the sample limits were not found to be related ($r=-0.04; n.s.$). In addition, students in an introductory MIS course increased their scores as measured by this instrument from the beginning of the course to the end of the course.

Questions comprising our measure of computer literacy are shown below.

Following are a set of computer terms. Please circle the appropriate number, where $1=I$ know nothing about this and $5=I$ know a lot about this.

1. Mainframe
2. Floppy disk
3. Bit
4. Baud rate
5. Directory
6. Software
7. Modem

Here are a few more general questions about computers. Please circle only one answer for each question.

8. The brain of a computer is:
   - the operating system
   - the CPU
   - the printer
   - the mouse
   - I don’t know

9. Which of the following is a computer programming language?
   - CP/M
   - MS-DOS
   - BASIC
   - UNIX
   - I don’t know

10. The printer is:
    - an input device
    - an output device
    - part of the central processing unit
    - all of the above
    - I don’t know

11. A microprocessor can be thought of as:
    - a computer on a tiny chip of silicon
    - a set of logic elements
    - a digital electronics device
    - all of the above
    - I don’t know

12. A cursor is:
    - a movable marker showing your current position on the screen
    - a connection between a computer and an external device
    - a device that converts computer output to analog form
    - a temporary holding area in a computer’s memory
    - I don’t know
13. A program whose function is to help with “housekeeping” chores, such as restoring files, rearranging files, or converting data from one format to another is:
   - a word processing program
   - a graphics program
   - a utility program
   - a spreadsheet program
   - I don’t know

14. One type of computer memory is available for temporary storage of programs and data. Any information is erased when you turn off the system’s power. That kind of memory is:
   - a hard disk
   - a floppy disk
   - ROM
   - RAM
   - I don’t know

15. When you back up a file, you:
   - rewind it to the beginning
   - prepare the hardware or software to work in a certain way
   - protect the file so that it cannot be altered
   - make a copy of it
   - I don’t know

16. A computer is an ideal solution for which one of the following problems?
   - manipulating numbers
   - making decisions
   - clarifying values
   - all of the above
   - I don’t know

17. Have you ever written a computer program? (yes or no)
   - If yes, in which programming language?
   - If you have written a program in more than one language, list all the languages in which you have programmed.

18. Have you ever modified a computer program? (yes or no)
   - If yes, in which programming language?

19. Have you ever saved programs, data, or files on disk, tape, or cards? (yes or no)

20. Have you ever copied programs, data, or files on disk, tape, or cards? (yes or no)

Here are some computer acronyms. For as many as you know, please write in what the letters stand for. Skip the ones you do not know.

21. CPU

22. DOS

23. IC

References


Susan J. Winter is an Assistant Professor of Information Systems at Florida Atlantic University. She received her B.A. from the University of California at Berkeley, her M.A. from Claremont Graduate University and her Ph.D. from the University of Arizona. She previously served on the faculties of the University of Waterloo and of the University of Victoria in Canada. She has over ten years of international managerial and consulting experience. Her recent research interests include the impact of technology on the organization of work, the symbolic aspect of information technology (particularly, as related to the Internet and to Entrepreneurial Ventures) and the role of computer literacy in the support of end-user computing. Dr. Winter has published papers in such journals as Information Systems Research, Information and Management and the Journal of Vocational Behavior, presented her work at the International Conference on Information Systems and at the Academy of Management, and contributed chapters to scholarly books.

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