A SURVEY OF ATTITUDES TOWARD COMPUTERS

PERRY R. MORRISON *University of New England*

Perry Morrison's research interests include cognitive and personality correlates of computer performances, manacomputer communication, and societal effects of information technology
Author's Present Address: Professor Perry R. Morrison, Dept. of Psychology, University of New England, Armidale NSW 2351 Australia

ABSTRACT: What do people really think about computers and their impact? In 1970, a study of people's attitudes in North America showed computers to be regarded as either "beneficial tools of mankind" or as "awesome thinking machines." A recent survey taken in Australia and reported in this article, though, suggests there may have been a change in attitudes over the past decade. The Australians expressed much concern over the computer's possible disemploying and dehumanizing effects—as well as disquiet over the control computers could exercise over their lives. If these attitudes are typical beyond the shores of Australia, they could create a barrier to the widespread acceptance and application of computers around the world.

The interaction between human beings and computers is becoming an area of growing interest [1] because of the need for a wide cross-section of people to utilize them in the workplace. The study of this interaction extends from not only the ergonomic/design considerations of hardware, but also to the cognitive needs of users and their requirements for efficient operating systems and friendly software [3]. Another area, somewhat overlooked but growing in attention, concerns the influence of user attitudes toward computers and its effect on man–computer interaction.

Some of this research has manipulated user attitudes within the laboratory, while other work has measured subjects' "preformed" attitudes. Orcutt and Anderson [9], for example, allowed subjects to play the "prisoner's dilemma" via a computer terminal. Half the subjects were told their opponent was human for the first 30 game trials, and a computer for the second 30 game trials. The remaining subjects were led to believe the reverse. In reality, though, the computer served as opponent in all game trials and only the strategy employed by the computer was varied. Results indicated that the "apparent" opponent had no effect on the player's performance. But post-experimental questioning showed that subjects perceived the computer player as more depersonalizing and more powerful than the human opponent.

SOME PREVIOUS STUDIES

Other work [10] has demonstrated the susceptibility of these attitudes to manipulation (at least in an experimental context), regardless of the baseline attitudes of the individual. In this study, introductory psychology students were exposed to a textbook-based quiz administered by either a human-like program (involving the use of the subject's name, use of the personal pronoun, expressions of affect, etc.) or a mechanistic program requiring numerical responses. The experimental design was such that all subjects failed the initial quiz, undertook a period of relearning, then subsequently passed the retest.

Results showed the human and mechanistic type programs were rated as such by subjects. The human-like program was perceived as more human, less honest, and less courteous than the mechanistic program. More importantly, though, users perceived the computer to be more responsible for their quiz failure under the human-like mode of operation than under the mechanistic. Also, those exposed to the human-like program scored higher on both the initial test and the retest than those exposed to the mechanistic one. This finding held despite the already mentioned more negative attitudes of the first group toward the computer. In sum, a person's attitudes (and perhaps performance) apparently can be manipulated, depending on the computer's responses.

According to other work [7], though, a large proportion of the population may not be pleased to partake in any computer interaction. As part of his study, Lee administered a 20-item questionnaire to 3,000 North Americans over 18 years of

PRINCIPAL COMPONENTS ANALYSIS: METHOD USED TO ANALYZE THE SURVEY DATA

Principal components analysis is an analytic method available in most statistical packages grouped under "factor analysis." Though principal components analysis is a mathematical technique performed on sets of variables, the best way to explain it is in geometric terms.

Suppose we measure in a sample of people their height, weight, and using a scale of from 1 to 10, the "blueness" of their eyes, the "blondeness" of their hair, and the "fairness" of their skin. These data could be represented as a number of variable vectors where the cosine of the angle between the vectors represents the correlations between them and the length of each vector is an index of the variable's variance (see Figure 1). Note that the variable vectors form two clusters. Principal components analysis allows us to identify and name these clusters in situations far more complex than this.

GEOMETRICAL INTERPRETATION

Though principal components analysis uses *mathematical* operations on a matrix of pairwise correlations between the variables, Figures 2 through 4 illustrate the general procedure. First, a vector is placed such that the projections of the other variables onto it are maximized (Figure 2). That is, this single vector can be seen to *account* for the major portion of the variance in the variables (i.e., the length of the variable vectors). An iterative procedure is used to obtain this first "component," as it is called. Thereafter, another component is projected orthogonally (at right angles) to the first to account for the remaining amount of variance (Figure 3).

In this example, all variable vectors are in the plane of the paper; thus only two components can be extracted. However, it is likely that the variables would project into a third, (i.e., down into the paper or up from it) or even higher dimension. Given N variables, the variables could lie in a space of up to N dimensions. In such a case, N components would be needed to completely account for the variance of the variables. But, by using principal components analysis it would be possible to extract a small number of components that account for a reasonably large portion of the variance.

At this point in our example, we have extracted the two components that account for all the variance of the variable vectors. At this stage, though, they are not very interpretable. To accomplish this, the components are rotated. Usually, this is done (as in the varimax criterion) by maintaining the orthogonal relationship between the components and rotating so as to maximize the number of high and near zero projections of the variable vectors onto the components (Figure 4).

After rotation, the components become known as "factors" and the projections of the variable vectors onto them become known as "loadings." Principal components analysis supplies the loadings of each variable on each factor, the percentage of the variance that each factor accounts for in the variable set, and an eigenvalue for each factor—in this instance an index of the meaningfulness of the factor. Generally, factors with eigenvalues greater than or equal to one are retained as legitimate factors [5, 6]. Yet, some factors that meet this criterion,

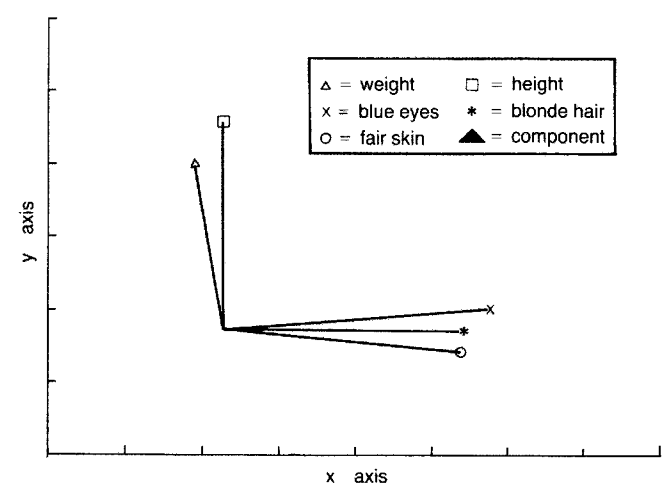

FIGURE 1.

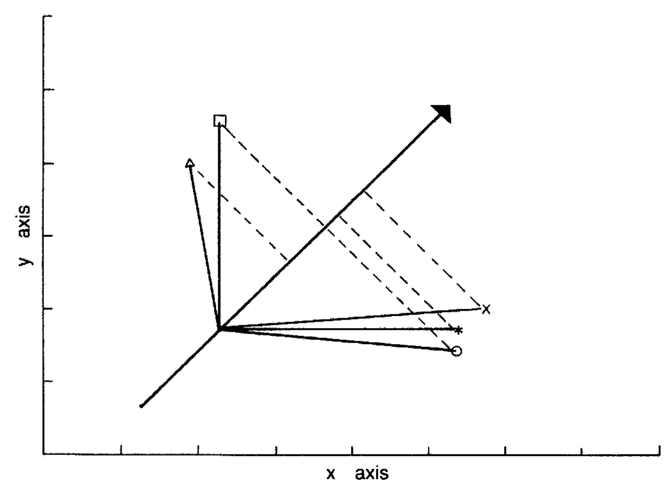

FIGURE 2.

age. Factor analysis (see box) of the resultant data revealed that the variance within the data could be attributed to two "higher order" variables: *the "beneficial tool of man" perspective*, represented by agreement with statements such as "They [computers] make it possible to speed up scientific progress and achievements," and "They are very important to the man-in-space programs"; and *the "awesome thinking machine" perspective*, represented by agreement with statements such as "Electronic brain machines are kind of strange and frightening," and "They sort of make you feel that machines can be smarter than people."

It's possible that the attitudes uncovered by Lee have acted as a barrier to more widespread acceptance and application of computers. Therefore, this study attempted to replicate Lee's work to see if the attitudes people had toward computers in 1970 still existed.

but that account for only a small portion of the variance, may be omitted for the sake of a more interpretable solution.

SOME ADDITIONAL POINTS

To help interpret the results of this study of computer attitudes, it is best to understand some additional points about principal components analysis. As a rule-of-thumb for social science data, only loadings greater than or equal to 0.4 are considered meaningful, or are said to "load."

The easiest way to interpret the factors is to consider the loading as correlations between the variable and the factor. A high, positive loading means high values of the variable are increasingly representative of the factor, while a high, negative loading means high values of the variable are increasingly nonrepresentative of the factor.

Consider the case where weight and degree of malnutrition are measured amongst a set of variables. If they load on the same factor, their loadings would be opposite in sign: with either malnutrition loading positively and weight negatively, or the reverse. By looking at those items that "load" and by taking into account the direction of the loading and what the variable is measuring, it is possible to label the revealed factors appropriately.

In the present example, simple inspection shows the loadings are either high and positive or low and negative. In Figure 4, height and weight define one factor that has been labeled "size," and the variables blue eye, blonde hair, and fair skin define another factor that has been labelled "Nordic."

Clearly, few of us would not have discerned the relationship between height and weight. And we could at least surmise the genetic relationship between blue eyes, blonde hair, and fair skin. Thus, the obvious advantage of the principal components technique is that it provides us with "composite" variables that can possibly tell us more about the structure of the data than the originally measure variables did.

SURVEY PROCEDURE

Subjects completed Lee's 20-item questionnaire using seven-point Likert scales. A Likert scale is usually a simple linear scale with anchor points placed along it at regular intervals. The two alternatives are placed at the extreme ends of the scale and the respondent's task is to place an "x" on the anchor point closest to his level of agreement (and not between the anchor points as this makes scoring too subjective). In this application, a simple agree/disagree dichotomy was used, though others can include adjectives (i.e., good–bad, ugly–beautiful) or statements to be evaluated.

A criticism often leveled at factor analysis is that the factor structures revealed are not stable or able to be replicated. To counter this charge, it is now common to split the data into two sets, making each set as equivalent as possible in known attributes (to prevent differences in the factor structure due to one sample's bias in an attribute such as sex). The data in both sets are then analyzed and compared. In accordance with this principle, when the total data for the present study were accumulated, they were divided into two sets (206 people in each set) so that, as far as possible, a respondent in Group One matched the age and sex of a respondent in Group Two.

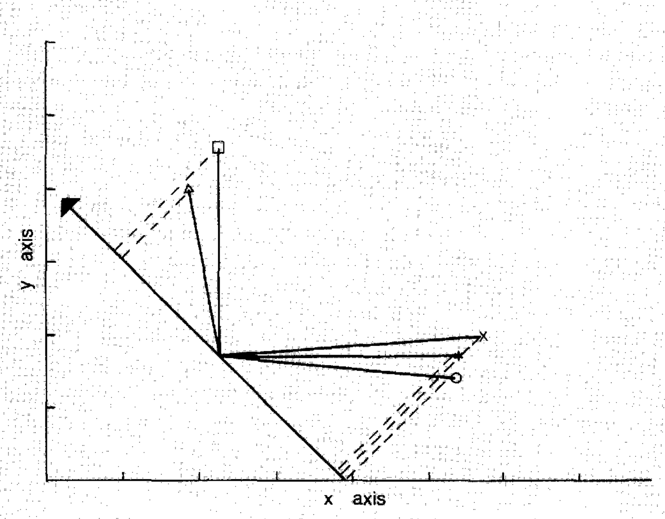

FIGURE 3.

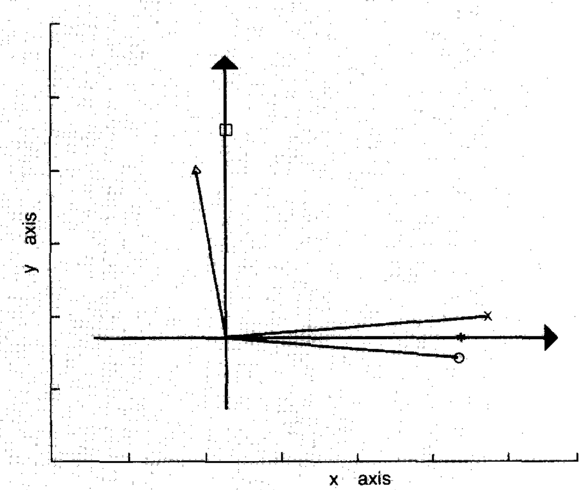

FIGURE 4.

CHARACTERISTICS OF PEOPLE SURVEYED

A total of 412 students from the University of New England (UNE) in Armidale, Australia were involved in the study. There were three types of students there:

- *Internal students* are full-time students who usually live in the university's residential colleges or within the immediate vicinity of the UNE. They have characteristics similar to American College students, i.e., between 17 and 30 years old, not fully employed, usually not financially independent.
- *Part-time students* also live close to UNE and attend normal lectures and other classes. However, because of work or other commitments they have a reduced subject load and take at least twice as long to complete their studies.
- *External students*, on the other hand, are more in the mold of correspondence students. They do not live in the surrounds of the university, and for each subject studied in a particular semester, they attend university classes for only one week. The remainder of the time they are mailed study material and are even examined externally. These students tend to be fully employed, married with families, and living far from UNE. A much more heterogeneous sample than the internals, these external students are probably quite representative of the Australian population at large.

There are 133 internal and 279 external students in the sample, with about equal numbers of males and females in each group. For externals, the mean age for females was 28.2 years; for males, 29.8 years. For internals, the mean age for females was 18.9 years; for males, 20.4 years.

DISCUSSION OF SURVEY RESULTS

The 412 responses to this computer-attitudes survey were divided into two equal sets, with 206 responses in each set (each set included responses from both internal and external students). The data in each set were then subjected to *principal components analysis* (see box). Analysis of the data in set 1 (i.e. analysis 1) revealed five factors with eigenvalues greater than unity. But a four-factor solution rotated to the varimax criterion proved the most interpretable and accounted for 49.2% of the total variance.

Table I gives the items, their loadings, the eigenvalue for each factor, and the percentage of variance for which it accounts. Since only item loadings greater than 0.4 are used for interpretation, items that meet this criterion are presented in Table II, along with the label given to each factor. For comparison, Table III provides Lee's factor structure.

At close inspection, the current attitude structure bears little similarity to Lee's. The first factor in Table II (16.1% of the total variance) defines a negative attitude toward computers. It loaded on items 8 (with these machines, the individual will not count for much anymore), 12 (they can make serious mistakes because they fail to take the human factor into account), and items 13 and 17. In Table II this has been labeled "negative" factor.

In the present analysis, the "awesome machine" factor denoted in Lee's study seems split into two smaller factors that account for 15.4% and 9.8% of the variance. All items that loaded on the second factor (items 4,9,15,19) loaded on the awesome machine factor. In Lee's results, other items also helped define this factor. The third factor seems to be mostly defined by these additional items of the awesome machine perspective (items 1,2,3,4) and seems to express an inadequate understanding of computers, to the point of astonishment. These factors have been labeled "awesome machine" (1) and (2) respectively in Table II.

Items 5, 6, and 7 comprise the only items to load on the fourth factor, and this dimension seems to reflect concern about the real positive (items 5 and 7) and negative implications of widespread computer application. This factor provides a sharp contrast with the previous one; it seems to represent a *realistic* concern by comparison to the *naive* concern of the third factor. It has been labeled "application" in Table II.

The responses of the remaining 206 subjects were also analyzed, using the principal components technique, to investigate the stability of the attitude structure revealed. This analysis revealed seven eigenvalues greater than unity, but the most parsimonious solution retained only five factors for rotation using the varimax procedure. Table IV shows those items loading 0.4 or greater on any factor.

Clearly, at least the first two factors of the first analysis have been reproduced in the analysis of the second data set. The remaining two factors identified in the first analysis are also present, though their order of extraction is slightly altered. Factor four of this analysis, for instance, bears a marked resemblance to the third factor of the first analysis, with only one item (number 2) failing to load, but nevertheless coming quite close (0.37). Similarly, factor three closely resembles the fourth factor of the previous analysis. Though loading on an additional item (11), this factor also seems largely concerned with the practical application of computers.

The last factor of the second analysis is a simple dimension of computer acceptance, loading positively on the 7th and 10th items and negatively on the 17th and 20th items (Table I). This factor has been labeled "positive" in Table IV.

Given the intervening period between Lee's study and this one, it is not unexpected that their findings differ. Indeed, in view of the different populations (North American vs. Australian) and sample sizes (3000 vs. 412), it would be surprising if the present study showed similar findings.

To begin with, there appear to be four dimensions common to the two analyses, accounting for almost half of the total variation in the data. Also, the largest amount of variance is explained not by a "beneficial tool of man" factor, as in Lee's study, but by a factor representing *negative* attitudes toward the possible disemploying and dehumanizing effects of computers and fears for their reliability and their power over the lives of individuals (factor 1 in both analyses).

A similar amount of the variance is accounted for by the "awesome machine perspective" identified by Lee: the science fiction view of computers as electronic brains (factors 2 and 3 in analysis 1 and factors 2 and 4 in analysis 2). Lastly, the beneficial tool of man perspective seems represented by a number of smaller factors (factor four in analysis one, factor three and perhaps five in analysis two).

IN DEFENSE OF THE PRESENT STUDY

Several criticisms could be leveled at a study of this type. The first issue is that of the sample and its representativeness of the population and its small size compared to the Lee study.

Most of the sample (68%) involved external students. These respondents could be considered representative of the Australian population for several reasons. First, their mean age (29.8 years for males, 28.2 years for females) and age range (up to 62 years) indicate they are not simply a sample of normal college students.

Second, these external students work, raise families, pay taxes, and live in widely displaced parts of Australia. Indeed, perhaps their only common characteristic is that they study at this university. Most of these students spend more time being members of different communities than in being students.

TABLE I. A Survey of Australians on Their Attitudes Toward Computers (1983)

Survey Questions (Variables)	Analysis 1				Analysis 2				
	Factor Loadings[2]				Factor Loadings[2]				
	1[1]	2	3	4	1[1]	2	3	4	5
1. There's something exciting and fascinating about electronic brain machines.	−0.13	0.15	**0.57**	0.07	−0.17	0.08	−0.03	**0.72**	−0.05
2. Electronic brain machines are kind of strange and frightening.	0.24	0.03	**0.46**	0.05	0.28	−0.06	−0.09	0.37	0.01
3. They are so amazing that they stagger your imagination.	0.02	0.16	**0.62**	0.22	0.05	0.09	0.22	**0.76**	−0.09
4. They sort of make you feel that machines can be smarter than people.	0.32	**0.50**	**0.45**	0.05	0.29	**0.45**	0.06	**0.50**	−0.08
5. They are very important to our man-in-space program.	−.21	−0.13	0.12	**0.60**	−0.28	0.12	**0.67**	0.09	0.08
6. They can be used for evil purposes if they fall into the wrong hands.	0.26	0.00	0.17	**0.74**	0.28	0.03	**0.80**	0.08	−0.18
7. They will help bring about a better way of life for the average man.	−0.37	0.19	0.08	**0.56**	−0.28	0.14	**0.62**	0.17	**0.44**
8. With these machines, the individual person will not count for very much anymore.	**0.74**	0.14	−0.03	−0.03	**0.70**	0.18	−0.09	−0.21	−0.20
9. They can think like a human being thinks.	0.01	**0.53**	0.20	−0.16	−0.01	**0.59**	−0.28	0.27	−0.04
10. These machines will free men to do more interesting and imaginative types of work.	−0.13	0.11	−0.13	0.06	0.06	0.05	0.03	−0.06	**0.84**
11. They are becoming necessary to the efficient operation of large business companies.	−0.12	0.01	0.16	0.33	−0.21	0.07	**0.41**	−0.05	0.10
12. They can make serious mistakes because they fail to take the human factor into account.	**0.42**	−0.16	0.23	−0.03	**0.71**	−0.23	−0.02	0.21	0.28
13. Someday in the future, these machines may be running our lives for us.	**0.57**	0.35	0.01	0.02	**0.68**	0.37	0.01	0.01	−0.06
14. They make it possible to speed up scientific progress and achievements.	0.04	−0.16	−0.09	0.35	0.09	−0.23	0.34	−0.02	0.28
15. There is no limit to what these machines can do.	0.16	**0.57**	0.01	0.01	0.11	**0.77**	0.06	−0.09	−0.05
16. They work at lightning speed.	0.26	0.02	0.38	0.08	0.13	0.10	0.05	0.17	−0.12
17. These machines help to create unemployment.	**0.57**	−0.16	0.23	−0.11	**0.54**	−0.13	−0.11	0.06	**−0.46**
18. They are extremely accurate and exact.	0.00	0.06	0.25	0.01	−0.02	0.06	0.01	0.26	−0.03
19. These machines can make important decisions better than people.	−0.09	**0.65**	0.06	0.07	−0.03	**0.73**	0.08	0.13	0.21
20. They are going too far with these machines.	0.33	−0.07	0.18	−0.11	0.34	−0.04	0.07	0.13	**−0.50**
EIGENVALUES[3]	3.22	3.08	1.96	1.56	3.05	2.96	1.93	1.53	1.35
% VARIANCE	16.1	15.4	9.8	7.8	15.2	14.8	9.6	7.7	6.7

[1] These numbers 1–4 and 1–5 are factors (see box). A factor is a composite variable. Example: If the individual variables measured were blonde hair, blue eyes, and fair skin, one could construct a composite variable or factor and label it "Nordic."
[2] The numbers in this table are loadings (see box). In effect, they are correlations between the variable and the factor. Only those loadings of 0.40 or greater are significant.
[3] The eigenvalue is an index of the meaningfulness of the factor: the higher the eigenvalue, the more meaningful the factor.

TABLE II. Australian Computer Attitudes Survey (Analysis 1): Items with Loadings of 0.4 or Greater and the Factors They Form

Survey Questions (Items)	Factor Loadings			
	1 Negative	2 Awesome (1)	3 Awesome (2)	4 Application
8. With these machines, the individual person will not count for very much anymore.	0.74			
12. They can make serious mistakes because they fail to take the human factor into account.	0.42			
13. Someday in the future, these machines may be running our lives for us.	0.57			
17. These machines help to create unemployment.	0.57			
4. They sort of make you feel that machines can be smarter than people.		0.50		
9. They can think like a human being thinks.		0.53		
15. There is no limit to what these machines can do.		0.57		
19. These machines can make important decisions better than people.		0.65		
1. There's something exciting and fascinating about electronic brain machines.			0.57	
2. Electronic brain machines are kind of strange and frightening.			0.46	
3. They are so amazing that they stagger your imagination.			0.62	
4. They sort of make you feel that machines can be smarter than people.			0.45	
5. They are very important to our man-in-space program.				0.60
6. They can be used for evil purposes if they fall into the wrong hands.				0.74
7. They will help bring about a better way of life for the average man.				0.56

Therefore, the argument that these findings are only generalizable to students is not tenable. Without a large, national project, it's difficult to imagine how a more representative sample could be measured.

Another reason for believing the data are representative of the total population is that the number of "usable" questionnaires exceeded 98%. By comparison with other surveys, which commonly have return rates of 30% to 60%, this is an admirable result.

Concerning the issue of small sample size, Lee's study is more adequate in this regard. Yet, in terms of statistical reliability, the current study meets the most stringent criteria laid down by statistical theorists. Thorndike [11] and Nunnally [8], for example, say the minimum sample size for factor analysis should be 10 times the number of variables. This is easily met by the current investigation.

Another strong point in support of the present study is that the major factors extracted in analysis one were replicated in analysis two. It is of minor importance that their order of extraction was slightly altered or that an additional low-order factor was discovered in the second analysis. The simple replication of the four major factors is a major success for a factor analytic study.

Some variables are short-term, such as variations in mood and levels of fatigue; while others are more "durable" such as differences in personality, intelligence, etc. Both varieties are equally uncontrollable in a survey, since it is impractical to administer measures of these in a sample as large as this. Hence, these variables of necessity contribute "noise" to the data. Generally, being able to account for nearly half the variance in "noisy" data such as this is a good result.

TABLE III. Lee's Survey of Computer Attitudes Among 3,000 North Americans (1970)

Survey Questions (Variables)	Factor Loadings	
	I	II
I. Beneficial Tool of Man Perspective		
14. They make it possible to speed up scientific progress and achievements.	0.59	0.02
5. They are very important to our man-in-space program.	0.56	−0.03
11. They are becoming necessary to the efficient operation of large business companies.	0.55	0.10
7. They will help bring about a better way of life for the average man.	0.53	−0.03
18. They are extremely accurate and exact.	0.52	−0.04
16. They work at lightning speed.	0.49	0.21
10. These machines will free men to do more interesting and imaginative types of work.	0.40	−0.04
II. Awesome Thinking Machine Perspective		
9. They can think like a human being thinks.	0.10	0.62
8. With these machines, the individual person will not count for very much anymore.	−0.09	0.60
4. They sort of make you feel that machines can be smarter than people.	0.13	0.57
13. Someday in the future, these machines may be running our lives for us.	0.02	0.56
15. There is no limit to what these machines can do.	0.17	0.50
19. These machines can make important decisions better than people.	0.21	0.46
2. Electronic brain machines are kind of strange and frightening.	−0.15	0.44
3. They are so amazing that they stagger your imagination.	0.13	0.42
17. These machines help to create unemployment.	−0.12	0.39

TABLE IV. Australian Computer Attitudes Survey (Analysis 2): Items with Loadings of 0.4 or Greater and the Factors They Form

Survey Questions (items)		Factor Loadings				
		1 Negative	2 Awesome (1)	3 Application	4 Awesome (2)	5 Positive
8.	With these machines, the individual person will not count for very much anymore.	0.70				
12.	They can make serious mistakes because they fail to take the human factor into account.	0.71				
13.	Someday in the future, these machines may be running our lives for us.	0.68				
17.	These machines help to create unemployment.	0.54				
4.	They sort of make you feel that machines can be smarter than people.		0.45			
9.	They can think like a human being thinks.		0.59			
15.	There is no limit to what these machines can do.		0.77			
19.	These machines can make important decisions better than people.		0.73			
5.	They are very important to our man-in-space program.			0.67		
6.	They can be used for evil purposes if they fall into the wrong hands.			0.80		
7.	They will help bring about a better way of life for the average man.			0.62		
11.	They are becoming necessary to the efficient operation of large business companies.			0.41		
1.	There's something exciting and fascinating about electronic brain machines.				0.72	
3.	They are so amazing that they stagger your imagination.				0.76	
4.	They sort of make you feel that machines can be smarter than people.				0.50	
7.	They will help bring about a better way of life for the average man.					0.44
10.	These machines will free men to do more interesting and imaginative types of work.					0.84
17.	These machines help to create unemployment.					−0.46
20.	They are going too far with these machines.					−0.50

SUMMING UP

For the population studied, concern over the possible societal effects of computerization was of overriding importance. This, coupled with the "awesome machine perspective" discussed by Lee, indicates that positive acceptance of computers by the populace is not yet apparent. This may point to the need for public education.

Alternatively, these findings could be due to anomalies in the small sample studied. No attempt was made, for example, to measure computer experience or educational level (the less intrusive the questionnnaire, the more likely respondents would return completed forms). Yet, it is always possible a slight bias in sample characteristics contributed to the present findings.

In addition, the longevity of people's attitudes about computers is open to question. Given further exposure to computers as they infiltrate the workplace, people's attitudes toward them will change. What form this will take cannot be predicted with certainty.

Finally, though these findings are very likely valid for the population studied, generalization beyond the Australian population is not advisable. While these attitudes may represent those of many Australians, they may not reflect the attitudes of people in other countries.

REFERENCES

1. Coombs, M. J., and Alty, J. L. *Computing Skills and the User Interface.* Academic Press, London, 1981.
2. Coovert, M. D., and Goldstein, M. Locus of control as predictors of user's attitude toward computers. *Psychol. Rep.* 47 (1980), 1167–1173.
3. Fried, L. Nine principles for ergonomic software. Datamation (Nov. 1982), 163–166.
4. Guilford, J. P. *Psychometric Methods.* McGraw-Hill, New York, 1954.
5. Guttman, L. Some necessary conditions for common-factor analysis. Psychometrika 19 (1954), 149–161.
6. Kaiser, H. F. The varimax criterion for analytic rotation in factor analysis. Psychometrika 23 (1958), 187–200.
7. Lee, R. Social attitudes and the computer revolution. Public Opinion Q. 34 (1970), 53–59.
8. Nunnally, J. C. *Psychometric Theory.* McGraw-Hill, New York, 1967.
9. Orcutt, J. D., and Anderson, R. E. Human computer relationships: interactions and attitudes. Behav. Res. Meth. Instrum. 6, 2 (1974), 219–222.
10. Quintanar, L. R., Crowell, C. R., and Pryor, J. B. Human-computer interaction: a preliminary social psychological analysis. Behav. Res. Meth. Instrum. 14, 2 (1982), 210–220.
11. Thorndike, R. M. *Correlational Procedures for Research.* Gardner Press Inc., New York, 1978.
12. Zolta, E., and Chapanis, A. What do professionals think about computers? Behav. Inf. Technol. 1, 1 (1982), 55–68.

CR Categories and Subject Descriptors: K.4.0 [**Computers and Society**]: General, K.4.1 [**Computers and Society**]: Public Policy Issues—privacy

General Terms: Human Factors

Additional Key Words and Phrases:

Received 7/83; accepted 9/83