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The Relationship of Attitudes to Computer Utilization: New Evidence From a Developing Nation

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Abstract — *The attitudes of students toward computers are significant determinants of behavior that may influence computer utilization. In this paper, a survey was conducted to study the relationship between attitudes and computer utilization of 238 students. The article also examined whether or not computer utilization was affected by some demographic (e.g., age) and other non-attitudinal variables. The findings indicated that the overall attitude did affect computer utilization. The part of attitude scale that presented the strongest predictor of utilization was computer liking followed by confidence. Anxiety and perceived usefulness were found to be insignificant determinants of computer utilization. In addition to attitude, other variables appeared to have a strong influence on computer utilization, namely the degree of computer experience, the degree of access to computers, and the number of computer-related courses taken by survey participants. © 1997 Elsevier Science Ltd*

Keywords — computer attitudes, computer attitude scale, computer anxiety, computer confidence, computer liking, computer usefulness, computer utilization

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BACKGROUND

With the enormous advances in communication and computer technology, the business world urgently needs the applications of this technology in order to compete and survive. However, computers cannot improve organizational performance if they are not used (Davis, Bagozzi, & Warsaw, 1989). Computer usage has been identified by many researchers as one of the most widely used measures of system success. Thus, organizational investment in computers to support planning, decision making, and communication processes is inherently risky if there is a possibility that people are unwilling to use computers that, if used, would generate significant performance gains (Alavi & Henderson, 1981; Nickerson, 1981; Swanson, 1988). In many cases, computerized systems fail when psychological reactions and organizational factors are ignored by system designers (Robey, 1979). Similarly, in an academic setting, the success of computer systems is largely dependent upon the attitudes of both instructors and students (Lawton & Gerschner, 1982). In Saudi Arabia, the issue of computer utilization becomes more important due to the rapid economic development the country is going through and the fact that it is the largest market for PCs (40%) in the Middle East (Al-Tawil, 1995). This paper examines the relationship between user attitude and computer utilization. Other non-attitudinal factors are examined to test their effects on computer utilization.

Several researchers have investigated the impact of user attitude on computer usage (Desanctis, 1983; Fuerst & Cheney, 1982; Ginzberg, 1981; Hartwick & Barki, 1994; Ives, Olson, & Baroudi, 1983; Locus, 1975; Robey, 1979; Robichaux, 1994; Schultz & Slevin, 1975; Srinivasan, 1985; Swanson, 1974, 1987). The findings of these studies have been mixed and inconclusive. This can be explained partly by the various different measures of belief, attitude, and satisfaction which were employed, sometimes without appropriate theoretical foundation. In turn, this can be explained by the fact that researchers in the field of information systems have been hesitant to use existing theories and models of other disciplines, especially those of social psychology literature, in studying the relationship between attitude and computer utilization (Davis et al., 1989; Goodhue, 1988; Robey, 1979). Due to this inaction, we have been getting mixed and inconclusive empirical support for the hypothesis that computer utilization is influenced by end-user attitudes (Davis et al., 1989; Robey, 1979; Schultz & Slevin, 1975; Thompson, Higgins, & Howell, 1991). Brock and Sulsky (1994) showed that attitudes toward computers are composed of two distinct factors: (a) belief that the computer is a beneficial tool and (b) belief that computers are autonomous entities. They found that these two attitudes toward computers have a significant relationship to computer use. However, the beneficial tool belief

has a much stronger relationship to computer use than the autonomous entity belief. Hebert and Benbasat (1994), found that 77% of the variance of intent to use information technology was explained by three attitude variables (beliefs related to perceived relative advantage and compatibility with previous work patterns, as well as result demonstrability). In general, no matter how sophisticated and how capable the technology, its effective implementation depends upon users having a positive attitude towards it (Culpan, 1995).

In the context of Saudi Arabia, little work has been done in this regard. A study done by Al-Amoudi (1995) showed that there is a generally positive attitude toward using computers among students in Saudi Arabia. In their study, Al-Khaldi and Ben-Bakr (1993) showed that usefulness and the affective part of attitude had a significant effect on personal computer utilization.

In recent years, information systems researchers have realized that there is a need to build a multidisciplinary approach to research on this topic using a cumulative research tradition which employs other referent disciplines, theories, and models as a foundation (Goodhue, 1988; Keen, 1980; Robey, 1979). In some cases, theories were borrowed from other disciplines (Fishbein & Ajzen, 1975; Triandis, 1980) in trying to explain the relationship between individual behavior and computer attitudes. A number of computer attitude scales have been developed to measure this relationship (Anderson, Klassen, Krohn, & Smith-Cunnien, 1982; Bear, Richards, & Lanscaster, 1987; Byrd & Koohang, 1989; Cambre & Cook, 1985, 1987; Griswold, 1983; Loyd & Gressard, 1986; Loyd & Loyd, 1985; Marshall & Bannon, 1986; Reece & Gable, 1982; Stevens, 1980).

The Computer Attitude Scale developed by Loyd and Gressard (1984a) seems to have achieved most popularity and use, in particular with undergraduate students. However, adopters of this scale (Colley, Gale, & Harris, 1994; Gressard & Loyd, 1987; Koohang, 1987; Loyd & Gressard, 1984a,b, 1986; Woodrow, 1991a,b) have not tested the relationship between computer attitude and computer utilization. All their efforts have been devoted to testing the reliability of the scale, or the effect of some variables (e.g., age, sex, and experience) on attitude (Al-Jabri, 1996; Al-Jabri & Al-Khaldi, 1997). Moreover, little research has been done to test the applicability of different theories in environments different from the United States or Europe.

Objective of the Study

The objective of the present study is to measure and analyze the relationships that we think exist between computer attitude and its components (anxiety,

confidence, liking, and perceived usefulness) and utilization of computers within the context of a major educational institution in Saudi Arabia. The major theoretical foundation of this research comes from the work of Loyd and Gressard (1984a) and Loyd and Loyd (1985). In addition, this study presents a replication of the Computer Attitude Scale in a culturally different environment to test its generalizability.

Definition of Attitude

Gibson, Ivancevich, and Donnelly define attitude as "a positive or negative feeling or mental state of readiness, learned and organized through experience, that exerts specific influence on a person's response to people, object and situation" (Gibson, Ivancevich, & Donnelly, 1991, p. 70). More specifically, Rosenberg defines attitude as the way an individual feels about and is disposed towards some "object" (Rosenberg, 1960).

Advocating the school of thought of Krech, Crutchfield, and Ballackey (1962), Triandis (1971) suggested that attitude consists of affective, cognitive, and behavioral components. The affective component of attitude is the emotional or "feeling" which includes statements of likes or dislikes about certain things. Accordingly, in the context of computers a statement such as "I like computers" or "I hate computers" is a measure of the affective component of attitude. The cognitive part of attitude includes statements of beliefs. For example, a certain individual may hold a belief that computers can significantly increase the quality of his/her output. The behavioral part of attitude is what the individual actually does or intends to do. Thus, a statement such as "I will use this new software to prepare the requested report" is a statement of intended behavior. Therefore, attitude consists of what individuals feel (affective), believe (cognitive), and plan to do (behavioral). The current study adopted an instrument called the Computer Attitude Scale (CAS), developed by Loyd and Loyd (1985), with different components that claim to account for the original three components of attitude. The components of the CAS are computer anxiety, computer confidence, computer liking, and computer usefulness.

Computer anxiety refers to fear of computers or the tendency of a person to be uneasy, apprehensive, and phobic towards current or future use of computers in general (Cambre & Cook, 1985; Igbaria, 1993; Loyd & Loyd, 1985). An example of a statement used to measure computer anxiety is "Computers make me feel uncomfortable."

Computer confidence refers to the ability to use or learn about computers (Gressard & Loyd, 1986). For example, a statement such as "I am sure I could do work with computers" could be used to measure confidence about

using computers. Computer confidence has been shown to be closely related to computer anxiety, with an inverse relationship (Loyd & Loyd, 1985).

Computer liking refers to liking or enjoying working with computers. For example, "I would like working with computers" could be a statement used to measure computer liking. Anxiety and liking represent the affective (feelings) part of attitude (Thompson et al., 1991).

Computer usefulness refers to the degree of perceived usefulness of using computers for present and future work. An example of a statement used to measure computer usefulness is "I will use computers in many ways in my life." This subscale partly measures the cognition (beliefs) part of attitude (Thompson et al., 1991).

HYPOTHESES

Loyd and Loyd (1985) claim that the original CAS scale is a reliable and valid measure of computer attitudes, and can be confidently and effectively used by researchers. Gressard and Loyd (1986) examined and validated the components of the original scale: computer anxiety, computer confidence, and computer liking (reliability of .95). In addition, the original CAS was tested along with other nine different computer attitude scales, and obtained the highest reliability measure of .94, with subscale reliabilities of .8, .86, and .85 for computer anxiety, computer confidence, and computer liking, respectively (Woodrow, 1991a). Later, a fourth subscale, labeled computer usefulness, with a reported reliability of .82, was added to the CAS (Loyd & Gressard, 1986).

This paper addresses the following hypotheses that relate to the effects of attitude and other personal variables on computer utilization

H1: Computer attitude is significantly related to computer utilization.

H1a: There will be a significant negative relationship between computer anxiety and computer utilization. Computer anxiety can be a determinant of learning (Farnill, 1985; Igbaria & Parasuraman, 1989; Jeffreys, 1986). Due to its importance, most studies of computer attitude have focused more on computer anxiety than on any other dimension. Extreme anxiety is disastrous to learning (Farnill, 1985; Jeffreys, 1986). However, a minimum amount of anxiety is needed to heighten learning and elicit some improvement (Mandler & Sarason, 1952). Furthermore, beyond the minimum level, computer anxiety causes stress, impacts performance negatively, and leads some potential users to avoid computers (Harrington, McElroy, & Morrow, 1990).

H1b: There will be a significant positive relationship between computer confidence and computer utilization. It has been shown by Thompson et al. (1991) that confidence is a significant predictor of computer utilization.

H1c: There will be a significant positive relationship between computer liking and computer utilization. Computer liking is represented by the affective domain of attitude. Al-Khaldi and Ben-Bakr (1993) found that affect had a significant effect on utilization, while Thompson et al. (1991) found no significant relationship between the affective component of attitude and utilization.

H1d: There will be a significant positive relationship between perceived computer usefulness and computer utilization. Lu and Gustafson (1994) found that perceived usefulness influences frequency of system use. In addition, Al-Khaldi and Ben-Bakr (1993), Dennis, Nelson, and Todd (1992), and Suh, Kim, and Lee (1994) indicated that usefulness is an important determinant of system use. Subramanian (1994) found perceived usefulness to be a determinant of predicted future usage. Igbaria (1993) indicated that computer perceived usefulness had positive effects on both behavioral intentions and user acceptance (utilization) of the system. Moreover, Thompson et al. (1991) found that perceived near-term and long-term consequences (usefulness) have a strong positive influence on computer utilization. Earlier supporting empirical evidence came from several studies, such as those of Davis (1989), Swanson (1982), and Schultz and Slevin (1975).

H2: Some external and personal factors, such as computer accessibility, computer experience, and computer education, will have a significant positive relationship on users' utilization of computers.

H2a: There will be a significant positive relationship between the degree of computer accessibility and computer utilization. It is believed that users with better accessibility are expected to have a higher degree of computer utilization. Schiffman, Meile, and Igbaria (1992) found that accessibility is positively correlated to frequency of use and time of use. In addition, Igbaria and Nachman (1990) found that hardware/software accessibility has a significant positive relationship to system utilization.

H2b: There will be a significant positive relationship between the degree of computer experience and computer utilization. Computer experience was found to have a significant positive effect on computer utilization (Fuerst & Cheney, 1982; Schiffman et al., 1992; Thompson, Higgins, & Howell, 1994). Igbaria (1993) indicated that computer experience had a strong direct and indirect effect on behavioral intentions and user acceptance (utilization) of the system.

H2c: There will be a significant positive relationship between the level of computer education and computer utilization. It was found that the number of computer-using courses taken was positively related to computer attitude (Wilson & Daubek, 1992). Therefore, it is fair to claim that the number of computer-using courses taken could positively affect computer utilization. In

addition, computer training has been given considerable attention by researchers (Fossum, Arvey, Paradise, & Robbins, 1986; Goldstein, 1980).

H2d: There will be a significant positive relationship between the cumulative grade point average (GPA) and computer utilization. Although there is little support from the theory, it is assumed that students with a high academic performance will use computers more than low performers. It was shown also that GPA has a positive correlation with computer attitude (Wilson & Daubek, 1992).

H2e: There will be a significant positive relationship between class standing (i.e., freshman, sophomore, junior, or senior) and computer utilization. Students at higher class levels are expected to utilize computers significantly more than those at lower class levels.

H2f: There will be a significant positive relationship between age and computer utilization. There have been mixed results with regard to the effect of age on computer utilization. Schiffman et al. (1992) found that age is positively related to frequency of use and time of use. However, Igbaria (1993) found a small but a significant negative effect of age on computer utilization. This factor is expected to be highly correlated with class standing and computer education (e.g., a senior student is expected to be older, and to have taken more computer-related courses than a sophomore student).

Figure 1 shows the proposed model for conducting this study which has been built on the earlier models of Igbaria (1993), Thompson et al. (1991), and Triandis (1980).

METHOD

Sample and Procedure

The data for this study was gathered by means of a questionnaire survey. The study was conducted in a Saudi Arabian university with a sample of 300 undergraduate students from different business majors (i.e., accounting, finance, management, management information systems, and marketing). Table 1 describes the profile of our sample. All subjects had taken (or were taking at the time of the study) at least one course in computer programming. The questionnaire was distributed during class time with a covering letter from the researchers. All respondents were guaranteed confidentiality. A total of 238 responses were returned, a response rate of 79%. Those who did not respond may have either missed the next class of the course when the questionnaire was collected or chosen not to respond. The researchers have no reason to doubt that the nonrespondents are represented by those who did respond.

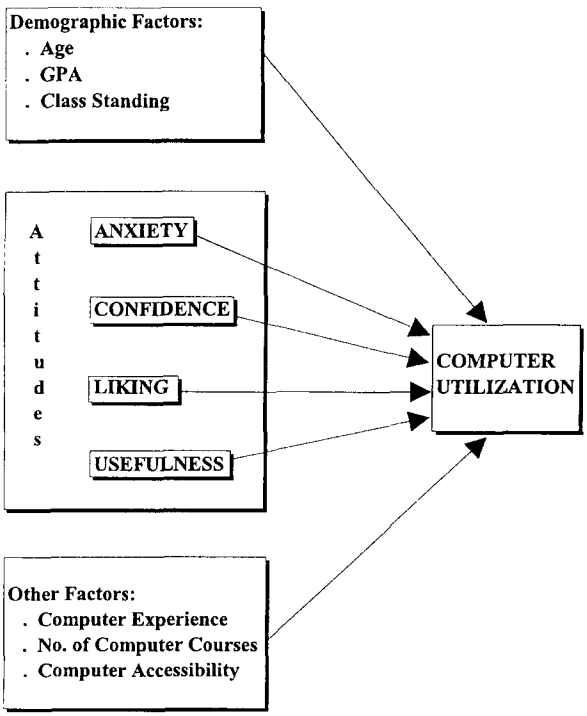

Figure 1. The research model. GPA=grade point average.

The university, where the study was conducted, had about 6500 male students, with about 700 students in the Business School. There were two personal computer laboratories with about 35 networked workstations located in the School of Business, in addition to several other computer laboratories located in other buildings outside the School of Business. Furthermore, several mainframe terminals were located in every building. These laboratories were usually open from 8:00AM to midnight.

The responses were coded and analyzed using the mainframe Statistical Analysis Systems. Statistical tests such as Pearson correlation and multiple

Table 1. Profile of the Respondents

	Major						
Class	Accounting	Finance	Management	Marketing	MIS	Others	Total
Freshman	6	2	4	18	25	2	57
Sophomore	13	8	8	21	9	2	61
Junior	6	3	2	16	4	0	31
Senior	14	14	1	34	12	10	85
Total	39	27	15	89	50	14	234
Percentage	16.7	11.5	6.4	38	21.4	6	100

MIS = Management Information Systems.

regression were used to assess the relationship between attitude with its components (anxiety, confidence, liking, and usefulness) and computer utilization.

Operational Measures

One school of thought led by Ajzen and Fishbein (1980), defines the attitudes in terms of the affective domain alone. In their view, the attitude toward using computers refers to the user's general feeling of favor or disfavor toward the use of computers. The CAS provides a more complex definition of computer attitude. The total number of CAS items is 40, with 10 items for each of the 4 components (anxiety, confidence, liking, and usefulness) of the attitude. Appendix A lists the attitude measurement scale items that were used. In measuring these constructs, respondents were asked to rate them according to how they feel about using computers and to make a check mark in the place that best describes their agreement or disagreement with every statement on a 5-point Likert-type scale (where 1 = *strongly agree*, 2 = *agree*, 3 = *neutral*, 4 = *disagree*, and 5 = *strongly disagree*). Item responses were coded so that a higher score indicated a higher degree of anxiety, liking, confidence, and usefulness. The four subscale scores were obtained by averaging the recorded items on the respective subscales.

Three indicators were used to measure the utilization of computers. The scale was adapted from Thompson et al. (1991) who, in turn, based their work on Cheney (1984), Pavri (1988), and Raymond (1985). The items of this scale were (a) intensity of use, (b) frequency of use, and (c) diversity of software packages used. The computer utilization score was obtained by averaging the recorded values on the three items (Thompson et al., 1991). Appendix B lists the measurement scale items that were used for computer utilization and demographic variables.

RESULTS

Descriptive statistics are reported in Table 2 for the four components of attitude. Table 3 represents the intercorrelations between the constructs. It indicates, as expected, some multicolinearity among all the four factors: computer anxiety, computer confidence, computer liking, and computer perceived usefulness.

The overall attitude is strongly related to computer utilization, indicated by a correlation coefficient of .42 at $\alpha = .05$. In addition, each one of the four attitude components is significantly correlated with computer utilization. All the correlations are in the expected directions, as shown in Table 3.

Table 2. Descriptive Statistics of the Computer Attitude Scale

Construct	No. of items	*M*	*SD*	Cronbach α
Anxiety	10	2.48	0.64	.78
Confidence	10	3.59	0.63	.84
Liking	10	3.46	0.58	.77
Usefulness	10	3.90	0.52	.70

Table 3. Pearson Correlation Coefficients of Attitude to Utilization

	Attitude constructs				Computer utilization
	Anxiety	Confidence	Liking	Usefulness	
Anxiety	1.00* (.0)	−.766 (.0001)	−.653 (.0001)	−.494 (.0001)	−.428 (.0001)
Confidence		1.00 (.0)	.703 (.0001)	.528 (.0001)	.481 (.0001)
Liking			1.00 (.0)	.555 (.0001)	.488 (.0001)
Usefulness				1.00 (.0)	.345 (.0001)
Computer utilization					1.00 (.0)

*Correlation coefficient with significance level in parentheses.

The regression model in Table 4 indicates that the attitude components collectively have a significant impact on the level of computer utilization, with an F value of 22.58, at $\alpha = .05$. About 28% of the variation in computer utilization ($R^2 = .279$) is explained by the model. Therefore, the first general hypothesis, *H1*, is not rejected.

A stepwise linear regression analysis was conducted to test the impact of attitude components by order on actual computer utilization. Only liking and confidence seem to enter the model at $\alpha = .05$, indicating that anxiety and usefulness are not important determinants of computer utilization (Table 5). This means that a high degree of multicolinearity exists among these variables. However, respondents seem to have a strong belief in the importance and benefits of computers, even if they are not heavily using computers. Moreover, the degree of liking significantly affects the degree of computer utilization.

Anxiety

Table 3 indicates that there is a strong negative relationship between anxiety and computer utilization ($r = -.428$), at a significance level of .05, in the expected direction. This indicates that the feeling of fear towards computers has a strong negative relationship to computer utilization. However, Table 4

Table 4. Regression Model of Attitudes and Computer Utilization

Parameter	Estimate	*t* Value	*p* Value	*SE*
Anxiety	−0.08	−0.67	.902	0.808
Confidence	0.31	2.32	.021	0.133
Liking	0.4	3.13	.002	0.128
Usefulness	0.09	0.73	.463	0.118

F value = 22.58; p value = .0001; $MSE = 0.754$; $R^2 = .279$.

Table 5. Stepwise Regression Analysis for Attitudes on Computer Utilization

Variable	Partial R^2	Model R^2	C(p)[a]	F	Probability > F[b]
Liking	.238	.238	12.3	73.7	.0001
Confidence	.038	.276	2.09	12.3	.0006

[a] Statistic proposed by Mallows (1964).
[b] The significance probability of the F value.

shows that computer anxiety is not a significant factor in predicting computer utilization, with a small beta coefficient of −.08, $t = -0.67$, and $p > .05$. As a result, the first specific hypothesis, *H1a* is rejected. A possible explanation for this is that some of the computer use by students is mandatory. In addition, the high correlation between anxiety and confidence ($r = -.766$) indicates that these two constructs are not independent.

Confidence

The correlation coefficient ($r = .481$) in Table 3 indicates, as expected, a positive significant relationship between computer confidence and its utilization at a .05 significance level. In addition, Table 4 shows that confidence is a significant predictor of computer utilization, with a beta coefficient of .31, $t = 2.32$, at $\alpha = .05$. Therefore, the second specific hypothesis, *H1b*, is not rejected.

Liking

The correlation coefficient ($r = .488$) in Table 3 indicates, as expected, a positive significant relationship between computer liking and its utilization at a .05 significance level. In addition, Table 4 shows that computer liking is the most significant predictor of computer utilization among the four components of attitude. Its beta coefficient is .4 at $\alpha = .05$, in the general regression model. As a result, *H1c* is not rejected.

Usefulness

The correlation coefficient ($r = .345$) in Table 3 indicates, as expected, a positive significant relationship between perceived computer usefulness and its utilization at a .05 significance level. However, Table 4 shows that computer perceived usefulness is not a significant factor in predicting computer utilization, with a beta coefficient of .09, $t = 0.73$, and $p > .05$. Therefore, the fourth hypothesis, *H1d*, is rejected.

Non-Attitudinal Variables

Another stepwise regression analysis was performed (Table 6) to see the effect of non-attitudinal variables on computer utilization. From the six variables, only four were significant and included in the model at $\alpha = .05$. In order of importance, the variables are computer experience, degree of access to computers, number of computer-using courses, and class standing.

From Table 7, it is clear that these non-attitudinal variables collectively have a significant impact on computer utilization, with an F value of 22.4, at a .05 significance level. The model explains about 40% of the variation in computer utilization ($R^2 = .402$). Therefore, the second general hypothesis, *H2*, is supported.

It is also clear that age is not a significant factor in determining computer utilization. This is likely due to the limited age range of the subjects, who

Table 6. Stepwise Regression for Non-Attitudinal Variables on Computer Utilization

Variable	Partial R^2	Model R^2	C(p)[a]	F	Probability > F[b]
Experience	.267	.267	42.22	74.56	.0001
Accessibility	.049	.316	27.63	14.80	.0002
Courses	.035	.351	18.13	10.75	.0012
Class standing	.042	.393	5.97	14.09	.0002

[a] Statistic proposed by Mallows (1964).
[b] The significance probability of the F value.

Table 7. Regression Model of Non-Attitudinal Variables and Computer Utilization

Parameter	Estimate	t Value	p Value	*SE*
Age	0.013	0.34	.735	0.039
Experience	0.443	4.93	.0001	0.089
Class standing	−0.192	−3.10	.0022	0.062
Courses	0.111	4.68	.0001	0.024
GPA	−0.081	−1.59	.1140	0.051
Accessibility	0.204	3.10	.0022	0.066

Abbreviation: GPA = grade point average.
F value = 22.4; p value = .0001; $MSE = 0.698$; $R^2 = .402$.

were all undergraduate students. The GPA is also not a significant factor. On the other hand, the degree of experience, accessibility, and number of computer-using courses taken do seem to significantly affect the level of computer utilization. Surprisingly, the class level seems to negatively affect utilization. As a result, the hypotheses *H2a*, *H2b*, and *H2c* were supported. On the other hand, hypotheses *H2d*, *H2e*, and *H2f* were not supported.

In summary, strong relationships were found between attitude and computer utilization. In addition, the effect of non-attitudinal variables was found to be stronger than the effect of attitude on computer utilization.

DISCUSSION

In this study, a theory proposed by Loyd and Loyd (1985) was adopted as a basis for examining the strength of relationship of different components of attitude to computer utilization. The findings showed all attitude components (anxiety, liking, confidence, and usefulness) to be significantly associated with computer use. However, only two parts of the CAS (liking and confidence) significantly affected computer utilization. Computer liking was the strongest predictor in the model, with $R^2 = .238$. This can be largely explained by the fact that in a traditional culture, such as that of Saudi Arabia, one can expect the affective judgments to play a major role in predicting behavior (Yavas & Yasin, 1993). In addition, the results of this study represent a confirmation of Woodrow's study which found that the CAS sampled attitudes from the affective and behavioral domains but not from the cognitive domain (Woodrow, 1991a).

CONCLUSIONS AND IMPLICATIONS

Limitations of the Study

The study was conducted in a university setting. Therefore, the generalizability of the results to knowledge workers should be treated with caution. The use of computers by students is sometimes mandated and not discretionary. In such a situation, the interpretations of user behavior will have limited value (Melone, 1990). In addition, the use of regression analyses does not eliminate the possibility that reverse causality exists contrary to the research model. For example, attitudes may be affected by the degree of computer utilization. By controlling some of the exogenous variables through an experimental design or by using structural analyses, one can have more confidence in identifying the cause–effect relationships. Moreover, this study relies on self-reported rather than actual measures. For example, the

frequency of computer use is self-reported use rather than based on an objective volume of use (e.g., the number of times a program or file is used). It is also important to note that this study did not focus on personal computers per se, but included the use of a mainframe. Finally, this study was conducted in a developing country, where the situation is different from universities in more developed countries in which the use of computers is at a more mature level.

Directions for future research

The CAS needs to be tested in further research to make sure it measures the three components of attitude. Moreover, we need to know which of the four subscales of CAS represents each of the affective, cognitive, and behavior domains. Without knowing that, we cannot claim that CAS has a strong theoretical base.

In their study, Loyd and Loyd (1985) found that two of their subscales (namely, anxiety and confidence) had a high loading on the same factor. This suggests that these two factors measure the same thing. In addition, this study represents some doubts with regard to the appropriateness of the different subscales to measure attitude. The validity of the CAS needs to be further assessed to conclude that these four measures are in fact independent, and are all needed to measure attitude.

Managers of computing support who wish to create an effective work environment need to be aware of the impact of individual differences on user work behavior. Future research should look at the relationships between these variables and the user behavior in a true work environment.

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APPENDIX A. COMPUTER ATTITUDE SCALE

Measures of Computer Anxiety:

- Computers do not scare me at all. (reversed)
- Working with a computer would make me very nervous.
- I do not feel threatened when others talk about computers. (reversed)
- I feel aggressive and hostile toward computers.
- It wouldn't bother me at all to take computer courses. (reversed)
- Computers make me feel uncomfortable
- I would feel at ease in a computer class (reversed)
- I get a sinking feeling when I think of trying to use a computer.
- I would feel comfortable working with a computer. (reversed)
- Computers make me feel uneasy and confused.

Measures of Computer Confidence:

- I am no good with computers. (reversed)
- Generally I would feel OK about trying a new problem on the computer.
- I don't think I would do advanced computer work. (reversed)
- I am sure I could do work with computers.
- I am not the type to do well with computers. (reversed)
- I am sure I could learn a computer language.
- I think using a computer would be very hard for me. (reversed)
- I could get good grades in computer courses.
- I do not think I could handle a computer course. (reversed)
- I have a lot of self-confidence when it comes to working with computers.

Measures of Computer Liking:

- I would like working with computers.
- The challenge of solving problems with computers does not appeal to me. (reversed)
- I think working with computers would be enjoyable and stimulating.
- Figuring out computer problems does not appeal to me. (reversed)
- When there is a problem with a computer run that I can't immediately solve, I would stick with it until I have the answer.
- I don't understand how some people can stand so much time working with computers and seem to enjoy it (reversed).
- Once I start to work with the computer, I would find it hard to stop.
- I will do as little work with computers as possible. (reversed)
- If a problem was left unresolved in a computer class, I would continue to think about it afterward.
- I do not enjoy talking with others about computers. (reversed)

Measures of Computer Usefulness:

- I will use computers in many ways in my life.
- Learning about computers is a waste of time. (reversed)
- Learning about computers is worthwhile.
- I'll need a firm mastery of computers for my future work.
- I expect to have little use for computers in my daily life. (reversed)
- I can't think of any way that I will use computers in my career. (reversed)
- Knowing how to work with computers will increase my job possibilities.
- Anything that a computer can be used for, I can do just as well some other way. (reversed)
- It is important to me to do well in computer classes.
- Working with computers will not be important to me in my life's work. (reversed)

APPENDIX B. COMPUTER UTILIZATION AND OTHER MEASURES

Computer Utilization Measures:

1. The *frequency* of computer use:

once or twice per month	once or twice per week	about once per day	several times per day
1	2	3	4

2. The *diversity* of software packages used for course work (number of packages):

one package	two packages	three packages	four packages	five packages or more
1	2	3	4	5

3. The *intensity* of class-related computer use (minutes per day at work):

less than 15 minutes	15–50 minutes	51–85 minutes	86–120 minutes	more than 120 minutes
1	2	3	4	5

Demographic Data:

1. Age: _____ years.

2. Class:

freshman	sophomore	junior	senior	graduate
1	2	3	4	5

3. Cumulative GPA:

< 2.0	2.1–2.5	2.6–3.0	3.1–3.5	3.6–4.0
1	2	3	4	5

4. How many computer-using courses have you taken? _____ course(s).

5. Your degree of access to computers:

very low	low	average	high	very high
1	2	3	4	5

6. How do you categorize your experience in using computers?

no experience	low experience	moderate experience	high experience
1	2	3	4