CAHRS
Center for Advanced Human Resource Studies

WORKING PAPER SERIES

Message and Medium: The Role of Social and Individual Factors in Using Computer Mediated Communications

Nathan D. Ainspan

Theresa M. Welbourne

Working Paper 9 8 – 2 5

ilr School of Industrial and Labor Relations

Advancing the World of Work

CORNELL
UNIVERSITY

Message and Medium:

The Role of Social and Individual Factors in

Using Computer Mediated Communications

Nathan D. Ainspan
Cornell University
Human Resource Studies
393 Ives Hall
Ithaca, NY 14853-3901
(607) 273 – 3419
nda1@cornell.edu

and

Theresa M. Welbourne
Cornell University
Human Resource Studies
393 Ives Hall
Ithaca, NY 14853-3901
(607) 255-1139
tw19@cornell.edu

Working Paper 98-25

http://www.ilr.cornell.edu/cahrs

ABSTRACT

The proliferation of computers and technology has resulted in increased use of computer mediated communications. However, the effective use of technology like bulletin boards and e-mail based communications can only be obtained if we understand how to enhance employee usage. Although human-computer interface has been a topic of considerable studies, most research has been done with students and under controlled conditions. In addition, field research has been limited in its inclusion of <u>both</u> social and individual factors that affect usage. In order to expand this research we report the results of a longitudinal study conducted within an entrepreneurial software company that used an innovative bulletin-board communication system. Our study uses employee survey data to measure social and individual factors that encompass attitudes toward the computer system. In addition, we obtained actual employee usage (copies of all postings to the bulletin board system) for the 12-month period of time following our survey. In addition to reporting the results of our study, we discuss implications of this work for other forms of computer mediated communications.

Computer mediated communications systems, such as electronic mail (e-mail) and computerized bulletin board systems (b-boards), have been widely accepted and integrated within the modern workplace. Employees in organizations of all sizes, from entrepreneurial start-ups to the largest multinational conglomerates, are using e-mail to communicate messages to other employees. The growth and expense of these systems are unprecedented; American companies are projected to spend $30.1 billion dollars on e-mail technology in 1998. By the year 2000, 7 trillion e-mail messages will be flying across the Internet every day (Electronic Messaging Association & Wilkofsky Gruen Associates, 1996). According to a recent study by the Society for Human Resource Management, employees at ninety percent of all American companies have e-mail access on the job (Society for Human Resource Management & SAS Institute, 1997).

Despite the widespread use of e-mail and b-board systems and the time and money companies have invested in them, many firms are not seeing the benefits of improved communications that they had originally hoped to find. And frequently, it is not a technical difficulty that creates this problem but a disconnect between employee attitudes or perceptions of the systems and the way the organization wants the system to be used. Although technical issues have been vigorously addressed in the research fields of "human-computer interaction" or "usability engineering," research demonstrates that employee attitudes and perceptions of computers also play a critical role in understanding why computerized communications systems may not be delivering on their promises (for reviews of the usability literature, see Allen, 1991; Davis, 1993; Davis, Bagozzi & Warshaw, 1989; Dillon & Morris, 1996; Guimaraes & Igbaria, 1997; Swanson, 1982). Reviewing the literature on information technology design, Garson (1993) concludes that most information technology failures stem not from technical difficulties but from people issues (both sociological and psychological). He then suggests that the answers to increased efficiency from office communications systems will come from studying the psychology of the systems' users. "Behavioral science," he states, "rather than computer science may be more relevant to understanding and addressing the problem of computer foul-ups" (p. 231).

There have been a number of studies on employee attitudes toward computer usage; however, the work conducted to date has been constrained by the data limitations and the research designs of these studies. Several studies have examined employee attitudes toward computer use (e.g., Adams, Nelson & Todd, 1992; Barki & Hartwick, 1994b; Ferguson, 1997; Harrison & Rainer, 1992a; Harrison & Rainer, 1992b; Igbaria & Guimaraes, 1994; Jackson,

Chow & Leitch, 1997), but these studies fail to link attitudes to actual usage behaviors. Instead, they used self-report scores of an individual's system usage and skill level. The accuracy of self-reported data has been questioned by Collopy (1996) and Straub, Limayemm & Karahanna-Evaristo (1995) who correlated self-reported data with actual usage (collected by monitoring subjects at computers after having subjects complete questionnaires). The results of their study show weak relationships between self report scores and computer usage.

Another set of studies linked attitudes with data obtained from monitoring system usage; however, the conditions under which the studies were conducted raise questions about their generalizability. In some of these studies, students were asked to imagine themselves as employees using computers in a workplace environment (e.g., Al-Khaldi & Al-Jabri, 1998; Anderson, 1996; Bagozzi, Davis & Warshaw, 1992; Bozionelos, 1997; Mathieson, 1991; Robichaux, 1994). In other studies, office environments were created in laboratories (e.g., DeSanctis, 1983; Galegher & Krant, 1994; Griffith & Northcraft, 1994). And in another set of studies, communications from an office system were studied, but only a small faction of communications were sampled (e.g., Finholt & Sproull, 1990). Thus, most of the studies using real measures of computer usage (vs. self report data) lack the completeness, social context, job characteristics, social cues, and organizational environment that affect daily usage of computer systems in organizational environments. Lastly, most prior research collected data only at one time, preventing the researcher from seeing any usage effects over time in a longitudinal analysis**.** Both Chidambaram (1996) and Jackson et al. (1997) underscore the necessity of capturing longitudinal data to understand how people use systems. Few studies in the literature, with Astebro (1995), Tillquist (1996) and Zack & McKenny (1995) as rare examples, collect usage data by examining the electronic communications generated by subjects operating under the same conditions identical to those experienced by users in most organizations on a daily basis.

In order to expand research on computer communications in the workplace, our study does several things. First, we conduct our study on a unique bulletin-board (b-board) system that represents the type of technology many firms are currently incorporating in the workplace. Where e-mail systems provide users with a one-to-one communication, company b-boards give all employees in the corporation access to all postings on the board. The unique computer program we study was used by a fast-growth entrepreneurial firm as a method for enhancing employee communications. Each week employees provided a summary of their accomplishments, work progress, and problems to the president and all other members of the

company (including management and peers) by posting to the b-board system. Anyone in the company, including the president, could respond to the employee.

Second, our research expands current work by studying how employee attitudes affect usage via a longitudinal, field-based research design. We conducted an employee survey at time one and then collected actual computer usage data from time one to time two (covering one calendar year). Because each employee could only generate a maximum of fifty messages during the year (one for each week of the 52 weeks each year that they were employed minus two weeks of vacation), a baseline number of messages in the time period was available. And since no employee could contribute more than fifty messages, a manageable number of observations was available to be analyzed without sampling. With the president imposing some structure on what the employees should write (e.g. progress reports, problems encountered), a content baseline also existed, alleviating the methodological difficulty of making "apples and oranges" comparisons between the different types of postings and purposes for which the system was used.

Lastly, our study merges research from the field of technology (focusing on human - computer interaction) with some of the more traditional organizational behavior research in order to test three hypotheses. As a result, we examine the influence of three types of employee perceptions on b-board system usage: 1) satisfaction with the utility of the system; 2) perceived facility with using computers; and 3) concern about who will see the information.

FACTORS AFFECTING COMPUTER MEDIATED COMMUNICATIONS USE

When computing systems moved from giant mainframes used only by technicians or programmers to individual desktop units used by everyone in an organization, the "human side" of software and hardware became even more critical to the designers and implementers of systems. The scientific study of "human-computer interaction" or "usability analysis" was created and is now taught alongside programming languages in university computer science departments. In the development of new products, hardware and software manufacturers deploy teams of employees to analyze each new product for its human usability and offer suggestions on improvements for each new version. (For a review and historical development of the science and literature of usability analysis and human-computer interaction see Fox, 1990; Johnson, 1992; and Shaw, 1991).

Systems Satisfaction

One element of the human-computer design of critical interest is individual acceptance of and satisfaction with computer systems. "Without acceptance", Dillon & Morris (1996) state in their review of this literature, "discretionary users will seek alternatives, and even dedicated users will likely manifest dissatisfaction and perform inefficiently, negating many if not all of the presumed benefits of a new technology" (p. 3). Thus, if system acceptance is low among employees, the system will probably not be used as it was designed and the time and money spent on the system will have been wasted. User acceptance is so crucial to the success of an information system that user resistance to a system could undermine and become directly responsible for the system's failure (Davis, 1993; Gould, Boies & Lewis, 1991).

One frequently used model to understand information technology acceptance is the Technology Acceptance Model (TAM) of Davis (1989). In the TAM, Davis applies Fishbein & Ajzen (1975)'s "Theory of Reasoned Action" (TRA) to attitudes about high technology. In the TAM model, Davis suggests that overall satisfaction with the system will be based on both perceived ease of use of the system and the system's perceived usefulness (perceived ease of use also in turn impacts perceived usefulness). In the model, attitudes towards using the system influence an employee's intent to use the system (which also is affected by the system's perceived usefulness), and this in turn determines the individual's usage. Many researchers have used the TAM model (e.g. Adams et al., 1992; Davis, 1993; Davis, Bagozzi & Warshaw, 1992; Gefen & Straub, 1997; Igbaria, Parasuraman & Baroudi, 1996; Igbaria, Zinatelli, Cragg & Cavaye, 1997; Mathieson, 1991; Straub et al., 1995). Their research has confirmed that attitudes are related to computer usage.

Therefore, our first hypothesis is based upon the findings of research conducted by application of the TAM model in prior studies of computer usage. We expand that work to a different form of computer-based communication (as will be discussed later in the methods section) but think the relationship between attitudes and behavior will be consistent with results found in prior research on the topic.

Hypothesis One: An individual employee's perceived satisfaction with the b-board

communications system will be positively related to usage.

Computer Ability

In addition to satisfaction, users' comfort level and confidence in their computer skills should influence how often they use a computer-mediated communications system. Bandura's concept of "self-efficacy" (Bandura, 1977; Bandura, 1982) has been related to an individual's

confidence in his/her ability to perform tasks, motivation to perform the task, and success in completion of the task. The study of self efficacy has been extended to research on computer usage (Compeau & Higgins, 1995; Harrison & Rainer, 1992a; Hunton & Beeler, 1997). Concepts regarding self efficacy are included in Ajzen's (1991) Theory of Planned Behavior, (TPB) (Taylor & Todd, 1995), which is an expansion of the TAM model. In the TPB, a third influence on computer attitude and behavior, perceived behavioral control, is added to the equation (Dillon & Morris, 1996). Al-Khaldi & Al-Jabri (1998) find that the most powerful factors contributing to positive computer attitude in their subjects is the perception of liking computers and confidence in using the technology.

Conversely, individuals with fear, anxiety or a suspicion of computer technology, a belief that the computer will negatively impact their life, or previous negative experiences with other systems will reduce a user's perceived facility with a system and thus reduce desire to use the system. Some individuals may have a fear or anxiety towards computers (Coover & Delcourt, 1992; Heinssen, Glass & Knight, 1987), which has been dubbed "computerphobia" (e.g. Weil, Rosen & Wugalter, 1990). Other computer users may be skeptical of elements of the technology or avoid the technology altogether if they see it controlling their work or invading their privacy (Aiello & Svec, 1993; Chalykoff & Kochan, 1989; DiTecco, Cwitco, Arsenault & André, 1992; Fenner, Lerch & Kulik, 1993; George, 1996; Nebeker & Tatum, 1993; Schleifer & Shell, 1992). Users may also believe that computers are cold, dehumanizing, and impersonal entities (Zoltan & Chapanis, 1982), see computers at the root of negative change, blame the technology for lowering the quality of their work life (Palmquist, 1992), or even depriving them of their employment (Lee, 1970). Others may have had negative experiences with computer systems in their past or feel that the current systems were designed without their input and feel left out of the system (Barki & Hartwick, 1994a; Griffith, 1993; Hunton & Beeler, 1997; Igbaria & Guimaraes, 1994; McKeen & Guimaraes, 1997; McKeen, Guimaraes & Wetherbe, 1994). All of these experiences contribute to feelings that an individual can or cannot use computers, and these feelings or perceptions should directly affect b-board system usage.

Hypothesis Two: Individuals who are confident in their ability to use computer systems
will be more likely to use the computerized bulletin-board system.

Concern with Others

In addition to the individual perceptions described above, the social mileau of each organization also exerts an influence on an individual's decision to use a computer mediated

communications system. Tillquist (1996) comments that information technology is not only a medium of human interactions but is also a "product" created by interactions in the organization. Garton & Wellman (1995) extend media scholar Marshall McLuhan's aphorism (McLuhan & Fiore, 1997) into the social arena, explaining that "if medium is also a message, analysts must consider the social meanings attributed to a communication medium and the context within which it is used" (p. 438). Research on computer system usage supports these ideas. Fulk, Schmitz & Steinfield (1990), for example, see media use influenced by social variables in addition to individual experiences and facility with systems. Igbaria et al. (1996) report that motivation to use computers is significantly affected by social pressure as well as by its perceived usefulness and the individual's facility to use the systems. Compeau & Higgins (1995) find that employees are encouraged to use computers by others (peers) in the organization.

One way that the social environment can influence an individual's decision to use computer equipment is impression management, or a desire to use the equipment to improve or change a group's perception of an individual's abilities and competence. (For a review of the impression management literature, see Rosenfeld & Giacalone, 1991; Rosenfeld, Giacalone & Riordan, 1995 or Leary & Kowalski, 1990). Based on the work of Goffman (1959), impression management suggests that individuals will monitor the impressions of others, and then communicate verbally and nonverbally to influence and construct these impressions. Walther (1993) utilizes the communications and information technology literature to review how technology can be used for impression management. In workplace environments, researchers have shown that subjects use impression management when they know their computer usage is being recorded. Rosenfeld et al. (1991), Booth-Kewley, Edwards & Rosenfeld (1992), Potosky & Bobko (1997) and Lautenschlager & Flaherty (1990), for example, find that subjects who use computers to complete questionnaires are more cautious of the impressions they present using the technology than subjects who complete similar questionnaires in a paper and pencil format. In another example, intentionally creating a "Big Brother" situation where subjects knew they were monitored, Rosenfeld, Booth-Kewley, Edwards & Thomas (1996) see higher levels of impression management than those who were not being monitored. Thus, we suggest that concern over the impressions made by their comments on the computer system -- expressed as a greater concern of how often others look at the system's communications -- will affect usage of the system.

Hypothesis Three: Employee concern over the degree to which their comments will be read by others will affect their usage of the system.

METHODS

Research Site and Data Collection Procedures

Data were collected from a software company in the Silicon Valley area. At the time of the study, the company was fairly new (formed five years before the study was conducted), privately owned, and entrepreneurial in nature. The company had enjoyed steady growth since its inception with its staff doubling every year prior to the study, so that it employed 200 individuals at the time the survey was administered.

A broader employee attitude survey was administered to the employees at time one of our study. Questions related to the bulletin-board system were included as part of the overall study.   From the time of the survey to one -year after the survey we then collected archival data on bulletin-board system usage.

The company's president encouraged completion of the survey in a cover memorandum, and as a result, 160 surveys (80% response rate) were returned. Demographic information was collected on the survey and the questions related to the bulletin-board system utilized a five-point Likert response format.

The Bulletin Board System

This bulletin board system was created through an initiative of the company's president in an effort to enhance communications throughout the company. During his introductory meeting with all new employees, the president would request that each employee post a weekly report to the bulletin board system via the e-mail system. These postings to the bulletin board were supposed to include a progress report for the past week, projects that the employee was working on, problems or difficulties encountered by the employee, and any meetings, sales calls, or conferences attended by the employee. No format was specified and individual reports varied from an organized daily list of each day's activities to "train of thought" sentences to individual reports containing only a few lines describing bare details of their activities for the week. Employees were also encouraged by the president to comment on specific problems, difficulties, or conflicts they were having that could interfere with their work.

The president of the company read all reports and responded with comments as he felt they were needed. Responses ranged the gamut: On a simple and direct level, the president added a quick note of thanks to the employee for a particular job well done. In more complex situations, he forwarded messages to managers with requests to investigate and correct

problems described by the employees. In one example, administrative assistants commented to the b-board system that their responsibilities to cover the reception desk took time away from their primary responsibility of producing sales brochures. The president responded by forwarding the letters to managers and asking them to rearrange schedules and hire additional help to cover the phones. This bulletin board system was accessible to all employees in order to encourage open information sharing among them. It was hoped that the system would allow issues to be brought out into the open and addressed among the employees themselves. Therefore, any employee could read any past or present posting made by any other employee in the company.

Independent Variables

We included a number of questions to measure satisfaction with the b-board system, computer ability, and concern for others reading their messages. The items were developed by referring to prior research (Anderson, 1996; Al-Jabri & Al-Khaldi, 1997; Davis, 1989; Igbaria, Parasuraman & Baroudi, 1996; Pinsonneault & Heppel, 1998; Rafaeli, 1986) , customizing to make sure that the items addressed the company's b-board system, and after reviewing the items with a group of employees and managers who participated in a pilot test of the survey. See Table 2 for a list of all items that emerged from the factor analysis (the factor analysis results in Table 2 will be discussed later in the paper).

Dependent Variables

To achieve a mixed-measure analysis and avoid common method error, our dependent variable came from the employee postings to the bulletin board. We were provided with printed copies of all employee messages to the system for one calendar year following the administration of the survey. The messages were indexed by employee, analyzed, and tabulated for each employee. These postings were handled in strict confidence to guarantee the protection of the privacy of the employees. Thus, only summary statistics or broad examples are presented in publication.

Postings to the b-board from a total of 141 employees were available. For each employee a total of 50 postings could be possible (one for each week of a 52 week year minus two weeks of vacation). Although employees were personally encouraged by the president to complete these postings, few followed through on this suggestion with any regularity. The mean number of postings to the bulletin board system was 5.43 (s.d = 10.04). This mean is reduced by a number of employees who were left company during the following year and thus were unable to submit fifty postings. The minimum number of postings is zero, and maximum

that one individual posted during the year is 40. Since enforcement was lax and employees might not make a posting if they had tight deadlines and deliverables to complete (a regular occurrence in a software company), only 35 percent of the subjects posted any messages to the board at all (49 subjects out of the 141 total). Also, few of the recent hires made postings to the system - out of the 41 individuals employed with the company for one year or less, only 6 made any postings. Of the employees who made postings, the mean number of postings was 15.63 (s.d. = 11.44).

A comparison of the means of a number of variables between the groups of employees who made postings and those who did not post to the system does not reveal significant differences. There are slight differences in tenure at the company and age. Non-respondents average 24.42 weeks and respondents average 32.39 weeks. The average age for non-respondents is 36.24 and for respondents, it is 37.76. Table One presents a comparison of the means between employees posting messages and those that did not post to the bulletin board.

Control Variables

The following control variables were collected: 1) age, 2) gender, 3) salary (log of salary used in the equations), 4) amount of incentive pay earned (log of this amount was used in the equations), 5) the highest level of education completed (on a scale from 1 for "less than high school" to 9 for Ph.D.), 6) tenure at the company, 7) total number of years of full-time work experience, and 8) a mean of the past six months of the employee's most recent performance ratings from their supervisor (from 1 to "poor" to 4 for "excellent"). Given that these employee characteristics may affect their relationship with their manager and the CEO (and their willingness to post to the b-board system), and that prior research on impression management and satisfaction with other organizational variables have found these demographic variables to be important, we included them as controls.

Table 1

Comparison of Means and One Standard Deviation

for Employees Submitting Postings Against Employees

Submitting No Postings

	No submissions (n=92)		Submissions (n = 49)	
	Mean	**s.d.**	**Mean**	**s.d.**
Postings	0.00	0.00	15.63	11.44
Age	36.24	8.00	37.76	7.40
Gender (1=M)	.57	.50	.55	.50
Salary (log)	10.94	.49	10.93	.35
Incent (log)	7.35	1.43	7.20	.55
Perf. Rev.	2.55	.41	2.70	.31
Tenure	24.42	21.40	32.39	18.32
Education	6.19	1.32	6.14	1.46
Work Experience	14.09	7.78	15.43	8.25
Satisfaction	3.44	.68	3.39	.62
Concern w/Others	1.45	.68	1.48	.73
Computer Ability	4.29	.63	4.36	.56

Analysis

A grouped logit model was used for the analysis. Like the probit model, the logit model
is used with data with categorical dependent variables. Logit and probit models are members
of the family of generalized linear models (McCullagh & Nelder, 1989; Nelder, 1977; Nelder &
Wedderburn, 1972) with a binomial (or Bernoulli variable) random component and an identity
link function connecting the random component (or in regression terminology the dependent
variable or "y") to the systematic component or predictors (independent variables or "x's" in
regression terminology) (Agresti, 1996). These models analyze the relationship of the
probability of success, noted as $pr(Y_i = 1) = {}^*_1$ to the independent variables. Unlike the least
squares estimation used in regression, these models use the procedure of maximum likelihood
estimation, with the maximum likelihood estimate selected to yield the largest value of the
likelihood of observing the particular Y probabilities in the data set.

To replicate a time-series analysis with the longitudinal categorical data we are using, a
"grouped" or "blocked" logit model was used to "unpack" the annual sum of each employee's
postings and thus in essence, test if each individual employee made a posting each week. In
other words, an employee made a binary decision each week to either post to the bulletin
board (a "success" or "1" in binomial terms) or to not post to the board (a "failure" or "0" in
binomial terms). Summing the year's worth of these figures creates the "packed" or "grouped"
total. The "blogit" command was used in the Stata statistical program to do this computation
and "unpack" each individual's data points from the compilation of the year's total (StataCorp,
1997).[1]

To control for employees who had been employed at the company for less than a year
(since an employee with four weeks at the company would only have four opportunities to post
to the system), a variable was created and used as an offset for each individual in each
employee's logit equation. This offset was based on the employee's tenure in the company. If
the employee was employed with the company for at least 52 weeks (e.g. one year or longer),
the offset variable for this employee was set to 50 (one year minus two weeks of vacation). An
employee with less than one year at the company received an offset number equal to the

---

[1] Because the data was collected every week for one year, the ideal choice of analysis would have been to use some
type of cross-sectional time-series models analysis on each employee's decision to post for each week. Examples of this
command include the Stata "xtgee" command (StataCorp, 1997) or the SAS programming language's "tscsreg" command (SAS
Institute Inc., 1993). However, this choice was not feasible for this study due to the sensitivity of these commands to missing
data. This data set has a large percentage of employees with missing values. Also, these commands can create equations that
are difficult to use for binomial equations. The blogit command thus provides a fairly close approximation for the time series
analysis of binomial data.

number of weeks that they were employed at the company during the year the messages were analyzed (e.g. an employee with a tenure of two months at the company received an offset number of eight).

RESULTS

Descriptive Data

The "average" employee (based on the means of the demographic variables) is a 36.77 year old male (s.d. = 7.81) with a bachelor's degree, 2.25 years at the company (s.d. = 1.72) (14.55 years full-time work experience, s.d. = 7.9). The mean salary is $61,911.67 (one standard deviation was 27,092.24) and the mean incentive earned is $2,431.06 (with one standard deviation of $10,638.28). The mean performance review (for each employee, an average of the past six months of performance review scores) is 2.61 (one standard deviation .38) with a range of 1 to 3.3.

Number of postings to the bulletin-board system is significantly and positively related to both performance review score (.19, $p \leq .01$) and tenure (.21, $p \leq .01$). In addition, satisfaction with the b-board system is negatively correlated with gender (-.19, $p \leq .01$), which means that women were less satisfied with the system than were men.

Factor Analysis

A principal components analysis was conducted on the questions answered on the questionnaire. Three factors emerged as useful (see Table Two for the results of the factor analysis). The three factors emerging are consistent with our hypothesized variables, although some of the items included in our survey dropped out. The factors are: (1) "Computer ability" or the perceived personal comfort the employee perceives with using computers (i.e. facility or confidence in computer skills), which has a coefficient alpha of .64, (2) "Concern with Others Reading", or questions about how the employee thinks how often others will read the b-board postings (coefficient alpha = .59), and (3) "System Satisfaction" or perceived usefulness of the b-board system, which has a coefficient alpha of .67.

Table II
Means, Standard Deviations, and Pairwise Correlation of Variables

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1) Postings	5.43	10.04	1.00											
2) Age	36.77	7.81	-0.00	1.00										
3) Gender (1=M)	.56	.50	-0.00	0.12	1.00									
4) Salary (log)	10.94	.45	-0.03	0.46***	0.30**	1.00								
5) Incent (log)	7.29	1.16	-0.08	0.06	-0.01	0.31**	1.00							
6) Perf. Rev.	2.61	.38	0.19*	-0.09	-0.13	0.04	0.17	1.00						
7) Tenure	27.23	20.65	0.21*	0.16	0.05	0.43***	0.19	0.15	1.00					
8) Education	6.17	1.36	-0.04	0.14	0.09	0.20*	-0.10	-0.04	0.10	1.00				
9) Work Exper.	14.55	7.94	-0.02	0.90***	0.15	0.39***	0.04	-0.08	0.12	0.02	1.00			
10) Satisfaction	3.42	.66	-0.06	-0.07	-0.19*	0.09	0.05	0.02	-0.03	-0.09	-0.11	1.00		
11) Concern w/Ot	1.46	.69	0.01	-0.03	0.08	0.02	-0.04	0.02	-0.10	0.07	-0.03	-0.03	1.0	
12) Comp. Ability	4.32	.60	0.12	-0.07	-0.06	0.03	0.05	-0.03	0.15	-0.05	-0.07	-0.09	-0.1	

Key: $* \ p \leq .05$
 $** \ p \leq .01$
 $*** \ p \leq .001$

Table III

Factor Analysis Results

Questions

	Bulletin Board Satisfaction
This bulletin board system gives me an opportunity to voice my concerns.	.813
I am very satisfied with the bulletin board system.	.782
This bulletin board system has increased overall communication at this company.	.728
(agree – disagree response format)	
	ALPHA = .67

How often do you find yourself at work thinking about who might read your postings to the bulletin board when you write them?

How much time do you spend worrying about who reads your postings to the bulletin board system.

(very little – very often response format)

I feel perfectly comfortable using computers.	.856
I am very confident in my level of computer literacy.	.859
(agree – disagree response format)	
	ALPHA = .59

Maximum Likelihood Estimation

The results of the blogit analysis are presented in Table Four with maximum-likelihood estimates used. The coefficients thus represent the change in the predicted probability that an employee will post to the bulletin board system (holding all other variables constant).

Table IV

Grouped Logit Analysis

Variable	Coefficient	Standard Error
Age	.01	.01
Gender	-.04	.10
Salary (log)	-1.15***	.15
Incentive (log)	-.04	.04
Mean of Perf. App.	.89***	.15
Tenure at Company	.01**	.00
Education Scale	.01	.04
Work Experience	-.01	.01
Satisfaction	.12†	.07
Concern w/Others	.14**	.06
Computer Ability	.24**	.09

n = 3,918

Log likelihood = -1727.5

X^2 test (df = 11) = 151.39***

Likelihood ratio tests (constrained versus full model) were all significant at
p of X^2 = .000 and conducted at the following levels:

1)   Full Model
2)   Model without System Satisfaction, Concern with Others, and Computer Ability (the three factor analyzed variables)
3)   Model without the above variables and without the Mean of Performance Appraisal, Tenure at Company, Education Scale and Work Experience (individual employee variables)
4)   Model without above variables and without the Salary (log) and Incentive (log) (reward variables)

Key:
*** $p \leq .001$ ** $p \leq .01$ * $p \leq .05$ † $p \leq .1$

Three demographic variables are significant in the logit equation: tenure at the company, the log of salary, and the mean performance appraisal. Thus, earning less income, receiving higher performance appraisals from supervisors, and having longer tenure at the company each significantly increases the predicted probability of posting to the b-board system. The salary and performance appraisal findings could be interpreted as expressions of the subjects using the system for impression management purposes. Those earning less could send postings to the system to create a "paper trail" of accomplishments in future discussions with supervisors for raises while those who do well on their performance appraisals want others to know what they have done each week and use the system to document their achievements.

The three factors that emerged out of the factor analysis are all significant and in the anticipated direction. The equation thus supports all three hypotheses. Satisfaction with the system (Hypothesis One) contributes to increased system use (with a .12 predicted probability). An employee's perceived level of computer skill (Hypothesis Two) increased the likelihood that a subject uses the system (.24 predicted probability). And concern about how often others read the postings (Hypothesis Three) increases system usage among the subjects that posted to the b-board system (.14 predicted probability).

DISCUSSION

The results from this study not only support the previous conclusions reached in the literature that individual perceptions of ability and comfort lead to increased usage but the findings also substantiate the more recent stream of research emphasizing the social environment's effect on individual proclivity to use computer mediated communications systems as well. In addition, we extend prior work by testing our hypotheses with computer usage data obtained form a corporation over a one-year period of time. The results of our tests lend support to the stream of research that emphasizes employee satisfaction with computer systems contributes significantly to how frequently employees use the systems. Concern for Others Reading B-board Messages

One explanation for the effects observed in our research may be the "public" nature of the bulletin board system. Computer-mediated communications systems have been categorized along two vectors into four categories (see Figure One). One vector is the timing of response - synchronous or immediate responses and asynchronous or delayed responses. A "chat room" discussion is synchronous since the user will see a response as the message is generated, while an e-mail or a b-board system is considered to be asynchronous since users

must wait for the recipient of a message to respond to each communication before the next one is sent. The other vector in this matrix is the audience of the communications, which can either be one-to-one or one-to-many. An e-mail or phone conversation is an example of the former and a b-board system is an example of the latter. Literature, including Goodhue & Thompson (1995), emphasize the need to understand the tasks that are being automated, and to select the communications technology with the features and elements with a proper "fit" for the tasks for which it is to be used.

Figure I

Matrix of Computer-Mediated Communications Categories

Audience   **Timing of Response**

	Asychronous (Delayed)	**Asychronous (Simultaneous)**
One-to-One	e-mail	telephone call
One-to-Many	b-board	chat room conference call

This company's b-board system used in this study is an example of an asychronous one-to-many communications system. Although the system was originally implemented and employees encouraged to post use the system to raise issues and concerns and for management to respond to them, the one-to-many nature of the system may have contributed to more people using the system for impression management, and in a sense, could have sabotaged the very reason for the system's creation. If "the medium is the message", employees will select a communications medium based on the nature of the message that they want to communicate. "Public" communications like commendations to a department or individual, quick messages, general announcements, or messages to manage impressions would be sent on one-to-many systems like bulletin board systems, "Lotus Notes" networks, intranets, or computer discussion groups. Conversely, one-to-one information systems would be selected for more sensitive, factual, or serious messages. And the most personal or sensitive information may be reserved for paper memorandums or in the most extreme cases, face-to-face meetings. If the company's president wanted accurate reports from employees with details of the problems occurring, it may have been more effective to instead allow employees to send private e-mail message to the president (or another one-to-one system) rather than posting it to the bulletin board. But in a one-to-many system, many employees,

afraid of retribution or looking bad to their superiors and peers, may have been hesitant to reveal problems or address issues that should have been brought out into open.

Anonymity

One special feature of the one-to-one communication that can make it an effective means of addressing concerns and problems is the concept of anonymity. Oliver (1995) sees anonymity disconnecting an individual from specific communications or events. In computer systems, anonymity was found to have varying limited impact, but it did increase the number of comments generated and increased the number of comments of a critical nature seen on the systems. Other research on anonymity has demonstrated the impact it can have on computer usage (Connolly, Jessup & Valacich, 1990; Lautenschlager & Flaherty, 1990; Sosik, Avolio & Kahai, 1997; Sproull & Kiesler, 1986; Tillquist, 1996; Valacich, Jessup, Dennis & Nunamaker, 1992.

The b-board system used in this study was practically the polar opposite of an anonymous one since everyone in the firm had access to and knew who wrote every posting to the b-board system. To encourage employees to reveal difficult problems and concerns, a more anonymous system could have been used, such as a computer system with an "anonymous remailer" function or even a paper suggestion box. Griffith & Northcraft (1994), for example, discusses the anonymous versus identified information technology systems and how to connect features like anonymity to the tasks for which the organization desires to use the system.

Limitations and Future Research

While gaining access to actual messages for post-facto analysis was useful and allows us to make a contribution to the literature to complement the findings from simulations, laboratories, or self-reported items, the nature of this data creates a number of questions and limitations. Generalizability questions emerge on a number of levels. The system studied - a public b-board system - is unique among computer-mediated communication system and possess defining traits that other systems do not share. Thus research on computer-mediated communications system of a more private nature (e.g. one-to-one rather than one-to-many) may generate different results. Generalizability to other populations could also be questioned. The subject pool utilized in this research is high-technology workers in the Silicon Valley area. Thus, the group should be expected to have greater familiarity and comfort with computer systems and an environment that is more open to their repeated usage. Generalizing to other

types of employees at other companies less familiar with computer systems or to any larger
population may not be possible.

In order to minimize problems associated with causality, we collected our independent
variable data (employee attitude data) at time one, and we collected dependent variable data
from time 1 to time 2 (one year period of time). While strengthening the study from a causal
interpretation perspective, it also creates a limitation. We do not know the extent to which
employee attitudes toward the b-board system changed over the 12-month period of time our
study was conducted. Future research should take both causality and changing attitudes into
consideration.

The usage of bulletin board postings as the dependent variable in this study creates
other limitations as well. The lack of responses in this company to what was supposedly a
required part of each individual's employment is certainly a source of concern, although this
does create a problem "replicated" on systems in many companies out in the field. It would be
useful in future research to look beyond the number of messages each employee posted and
conduct a content analysis on the messages in order to better understand how employees use
the systems and why postings were or were not made to the system.

SUMMARY AND IMPLICATIONS

The results from the data provide implications for both researchers and managers.
Future studies should differentiate between the types of computer-mediated communications
systems studied rather than just seeing them as one entity. Beyond this differentiation,
researchers should attempt to understand the features of the systems and link them to the
tasks to which the technology is applied in the organization. Future research should thus
investigate employees' differing responses to the various types of systems, as Griffith &
Northcraft (1994) recommend. However, caution must be used in how the data is collected in
"private" since employees may behave differently if they believe that their messages are
monitored by management. Employees who believe that their private messages are monitored
might treat a "private" computer-mediated communications as a public bulletin board system.

For managers, the question of public versus private computer systems should be
considered during the design and implementation of new systems. Care should be taken to
match the medium with the type of messages that the organization wishes to obtain through
the medium and the kind of information the company wishes to communicate and have
communicated by the employees. If managers want accurate and sensitive information

communicated, for example, they might not want to make the system as public as the one illustrated in this paper. And if employees perceive that e-mail or phone messages are monitored, a non-computerized system may have to be utilized in order to obtain this information.

The concerns raised above and the difficulty that many employees may have communicating difficult or unpleasant information over computer-mediated communications systems is magnified with the presence of the recent development of more employee spending more time "telecommuting" and less time in their offices. As more employees spend time with coworkers communicating electronically and more time in public computer systems and less time communicating through more private methods (like face to face meetings), bad news or difficult information may not be communicated as quickly or as easily and may in fact be "buried" or ignored.

Our research utilized a rich data source that is rarely analyzed in the computer usage literature - actual postings from an e-mail system - and tested and combined a number of theories about the perceptions and social factors that influence individual's decisions to use these systems. Despite some limitations discussed above, we think that the research results expand our understanding of the factors influencing system usage.

References

Adams, D. A., Nelson, R. R., & Todd, P. A. (1992). Perceived usefulness, ease of use, and usage of information technology: A replication. MIS Quarterly, 16(2), 227 - 247.

Agresti, A. (1996). An introduction to categorical data analysis. New York: John Wiley & Sons, Inc.

Aiello, J. R., & Svec, C. M. (1993). Computer monitoring of work performance: Extending the social facilitation framework to electronic presence. Journal of Applied Social Psychology, 23(7), 537 - 548.

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50, 179 - 211.

Al-Jabri, I. M., & Al-Khaldi, M. A. (1997). Effects of user characteristics on computer attitudes among undergraduate business students. Journal of End User Computing, 9(2), 16 - 22.

Al-Khaldi, M. A., & Al-Jabri, I. M. (1998). The relationship of attitudes to computer utilization: New evidence from a developing nation. Computers in Human Behavior, 14(1), 23-42.

Allen, B. L. (1991). Cognitive research in information science: Implications for design. In M. E. Williams (Ed.), Annual Review of Information Science and Technology, (Vol. 26, pp. 3 - 37). Medford, NJ: American Society for Information Science.

Anderson, A. A. (1996). Predictors of computer anxiety and performance in information systems. Computers in Human Behavior, 12(1), 61-77.

Åstebro, T. (1995). The effect of management and social interaction on the intra-firm diffusion of electronic mail systems. IEEE Transactions on Engineering Management, 42(4), 319-331.

Bagozzi, R. P., Davis, F. D., & Warshaw, P. R. (1992). Development and test of a theory of technological learning and usage. Human Relations, 45(7), 659-686.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84, 191 - 215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, 122 - 147.

Barki, H., & Hartwick, J. (1994a). Measuring user participation, user involvement, and user attitude. MIS Quarterly, 18(1), 59 - 79.

Barki, H., & Hartwick, J. (1994b). User participation, conflict, and conflict resolution: The mediating roles of influence. Information Systems Research, 5(4), 422 - 438.

Booth-Kewley, S., Edwards, J. E., & Rosenfeld, P. (1992). Impression management, social desirability, and computer administration of attitude questionnaires: Does the computer make a difference? Journal of Applied Psychology, 77(4), 562 - 566.

Bozionelos, N. (1997). Psychology of computer use: 65. Cognitive spontaneity as a correlate of computer anxiety and attitudes toward computer use. Psychological Reports, 80(2), 395-402.

Chalykoff, J., & Kochan, T. A. (1989). Computer-aided monitoring: Its influence on employee job satisfaction and turnover. Personnel Psychology, 42, 807 - 829.

Chidambaram, L. (1996). Relational development in computer-supported groups. MIS Quarterly, 20(2), 143 - 165.

Collopy, F. (1996). Biases in retrospective self-reports of time use: An empirical study of computer users. Management Science, 42(5), 758 - 767.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. MIS Quarterly, 19(2), 189 - 211.

Connolly, T., Jessup, L. M., & Valacich, J. S. (1990). Effects of anonymity and evaluative tone on idea generation in computer-mediated groups. Management Science, 36(6), 689 - 703.

Coover, D., & Delcourt, M. A. B. (1992). Construct and criterion-related validity of the adult-attitudes toward computers survey for a sample of professional nurses. Educational and Psychological Measurement, 52, 653 - 661.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319 - 340.

Davis, F. D. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. International Journal of Man-Machine Studies, 38(3), 475-487.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. Management Science, 35(8), 982 - 1003.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. Journal of Applied Social Psychology, 22(14), 1111 - 1132.

DeSanctis, G. (1983). Expectancy theory as an explanation of voluntary use of a decision-support system. Psychological Reports, 52, 247 - 260.

Dillon, A., & Morris, M. E. (1996). User acceptance of information technology: Theories and models. In M. E. Williams (Ed.), Annual Review of Information Science and Technology, (Vol. 31, pp. 3 - 32). Medford, NJ: American Society for Information Science.

DiTecco, D., Cwitco, G., Arsenault, A., & André, M. (1992). Operator stress and monitoring practices. Applied Ergonomics, 23(1), 29 - 34.

Electronic Messaging Association, & Wilkofsky Gruen Associates. (1996). Electronic mail size and prospects: Preliminary data from 1995 EPA market research study .

Fenner, D. B., Lerch, F. J., & Kulik, C. T. (1993). The impact of computerized performance monitoring and prior performance knowledge on performance evaluation. Journal of Applied Social Psychology, 23(7), 573 - 601.

Ferguson, C. (1997). The effects of microcomputers on the work of professional accountants. Accounting and Finance, 37, 41 - 67.

Finholt, T., & Sproull, L. S. (1990). Electronic groups at work. Organization Science, 1(1), 41-64.

Fishbein, M., & Ajzen, I. (1975). Beliefs, attitude, intentions, and behavior: An introduction to theory and research. Boston, MA: Addison-Wesley.

Fox, E. A. (Ed.). (1990). Resources in human-computer interaction. New York: ACM Press.

Fulk, J., Schmitz, J., & Steinfield, C. W. (1990). A social influence model of technology use. In J. Fulk & C. Steinfield (Eds.), Organizations and communication technology, (pp. 117 - 140). Newbury Park, CA: Sage Publications, Inc.

Galegher, J., & Krant, R. E. (1994). Computer-mediated communications for intellectual teamwork: An experiment in group writing. Information Systems Research, 5(2), 110 - 138.

Garson, G. D. (1993). Human factors in information systems. In R. T. Golembiewski (Ed.), Handbook of Organizational Behavior, (pp. 231 - 261). New York: Marcel Dekker, Inc.

Garton, L., & Wellman, B. (1995). Social impacts of electronic mail in organizations: A review of the research literature. Communications Yearbook, 18, 434 - 453.

Gefen, D., & Straub, D. W. (1997). Gender differences in the perception and use of e-mail: An extension to the Technology Acceptance Model. MIS Quarterly, 21(4), 389 - 400.

George, J. F. (1996). Computer-based monitoring: Common perceptions and empirical results. MIS Quarterly, 20(4), 459 - 480.

Goffman, E. (1959). The presentation of self in everyday life. Garden City, NY: Doubleday.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. MIS Quarterly, 19(2), 213-236.

Gould, J. D., Boies, S. J., & Lewis, C. (1991). Making usable, useful, productivity-enhancing computer applications. Communications of the ACM, 34(1), 74 - 85.

Gourieroux, C., Monfort, A., & Trognon, A. (1984). Pseudo maximum likelihood methods: Applications to Poisson models. Econometrica, 52, 701 - 720.

Griffith, T. L. (1993). Teaching big brother to be a team player: Computer monitoring and quality. Academy of Management Executive, 7(1), 73 - 80.

Griffith, T. L., & Northcraft, G. B. (1994). Distinguishing the forest and the trees: Media, features, and methodology in electronic communication research. Organization Science, 5(2), 272 - 285.

Guimaraes, T., & Igbaria, M. (1997). Client-server system success: Exploring the human side. Decision Sciences, 28(4), 851 - 876.

Harrison, A. W., & Rainer, R. K., Jr. (1992a). An examination of the factor structures and concurrent validities for the computer attitudes scale, the computer anxiety rating scale, and the computer self-efficacy scale. Educational and Psychological Measurement, 52, 735 - 745.

Harrison, A. W., & Rainer, R. K., Jr. (1992b). The influence of individual differences on skill in end-user computing. Journal of Management Information Systems, 9(1), 93 - 111.

Heinssen, R. K., Glass, C. R., & Knight, L. A. (1987). Assessing computer anxiety: Development and validation of the Computer Anxiety Rating Scale. Computers in Human Behavior, 3, 49 - 59.

Hunton, J. E., & Beeler, J. D. (1997). Effects of user participation in systems development: A longitudinal field experiment. MIS Quarterly, 21(4), 359 - 388.

Igbaria, M., & Guimaraes, T. (1994). Empirically testing the outcomes of user involvement in DSS development. Omega, The International Journal of Management Science, 22(2), 157-172.

Igbaria, M., Parasuraman, S., & Baroudi, J. J. (1996). A motivational model of microcomputer usage. Journal of Management Information Systems, 13(1), 127 - 143.

Igbaria, M., Zinatelli, N., Cragg, P., & Cavaye, A. L. M. (1997). Personal computing acceptance factors in small firms: A structural equation model. MIS Quarterly, 21(3), 279-305.

Jackson, C. M., Chow, S., & Leitch, R. A. (1997). Toward an understanding of the behavioral intention to use an information system. Decision Sciences, 28(2), 357 - 389.

Johnson, P. (1992). Human-computer interaction: Psychology, task analysis and software engineering. New York: McGraw-Hill Book Company.

Lautenschlager, G. J., & Flaherty, V. L. (1990). Computer administration of questions: More desirable or more social desirability? Journal of Applied Psychology, 75, 310 - 314.

Leary, M. R., & Kowalski, R. M. (1990). Impression management: A literature review and two-component model. Psychological Bulletin, 107(1), 34 - 47.

Lee, R. S. (1970). Social attitudes and the computer revolution. Public Opinion Quarterly, 53-59.

Long, J. S. (1997). <u>Regression models for categorical and limited dependent variables</u>. Thousand Oaks, CA: Sage Publications.

Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behavior. <u>Information Systems Research, 2</u>(3), 173 - 191.

McCullagh, P., & Nelder, J. A. (1989). <u>Generalized linear models</u>. London, England: Chapman and Hall.

McKeen, J. D., & Guimaraes, T. (1997). Successful strategies for user participation in systems development. <u>Journal of Management Information Systems, 14</u>(2), 133 - 150.

McKeen, J. D., Guimaraes, T., & Wetherbe, J. C. (1994). The relationship between user participation and user satisfaction: An investigation of four contingency factors. <u>MIS Quarterly, 18</u>(4), 427 - 451.

McLuhan, M., & Fiore, Q. (1997). <u>The medium is the massage: An inventory of effects</u>. San Francisco, CA: Hardwired.

Nebeker, D. M., & Tatum, B. C. (1993). The effects of computer monitoring, standards, and rewards on work performance, job satisfaction, and stress. <u>Journal of Applied Social Psychology, 23</u>(7), 508 - 536.

Nelder, J. A. (1977). A reformulation of linear models. <u>Journal of the Royal Statistical Society (A), 140</u>, 148 - 177.

Nelder, J. A., & Wedderburn, R. W. M. (1972). Generalized linear models. <u>Journal of the Royal Statistical Society (A), 135</u>, 370 - 384.

Oliver, C. (1995). Privacy, anonymity and accountability. <u>Computers & Security, 14</u>(6),   489-490.

Palmquist, R. A. (1992). The impact of information technology on the individual. In M. E. Williams (Ed.), <u>Annual Review of Information Science and Technology</u>, (Vol. 27, pp. 3 - 42). Medford, NJ: American Society for Information Science.

Pinsonneault, A., & Heppel, N. (1998). Anonymity in group support systems research: A new conceptualization, measure, and contingency framework. <u>Journal of Management Information Systems, 14</u>(3), 89 - 108.

Potosky, D., & Bobko, P. (1997). Computer versus paper-and-pencil administration mode and response distortion in noncognitive selection tests. <u>Journal of Applied Psychology, 82</u>(2), 293-299.

Rafaeli, A. (1986). Employee attitudes toward working with computers. <u>Journal of Organizational Behavior, 7</u>, 89 - 106.

Robichaux, B. P. (1994). Sex and beliefs about computer-based information systems: An examination of group support systems. <u>Omega, The International Journal of Management Science, 22</u>(4), 381 - 389.

Rosenfeld, P., Booth-Kewley, S., Edwards, J. E., & Thomas, M. D. (1996). Responses on computer surveys: Impression management, social desirability, and the big brother syndrome. Computers in Human Behavior, 12(2), 263-274.

Rosenfeld, P., & Giacalone, R. A. (1991). From extreme to mainstream: Applied impression management in organizations. In R. A. Giacalone & P. Rosenfeld (Eds.), Applied impression management: How image-making affects managerial decisions, (pp. 3 - 12). Newbury Park, CA: Sage Publications, Inc.

Rosenfeld, P., Giacalone, R. A., Knouse, S. B., Doherty, L. M., Vicino, S. M., Kantor, J., & Greaves, J. (1991). Impression management, candor, and microcomputer-based organizational surveys - an individual-differences approach. Computers in Human Behavior, 7(1-2), 23-32.

Rosenfeld, P., Giacalone, R. A., & Riordan, C. A. (1995). Impression management in organizations: Theory, measurement, practice. New York: Routledge.

SAS Institute Inc. (1993). SAS/ETS user's guide, version six, second edition. Cary, NC: SAS Institute Inc.

Schleifer, L. M., & Shell, R. L. (1992). A review and reappraisal of electronic performance monitoring, performance standards and stress allowances. Applied Ergonomics, 23(1), 49 - 53.

Shaw, D. (1991). The human-computer interface for information retrieval. In M. E. Williams (Ed.), Annual Review of Information Science and Technology, (Vol. 26, pp. 155 - 195). Medford, NJ: American Society for Information Science.

Society for Human Resource Management, & SAS Institute. (1997). 1997 SHRM e-mail and world wide web survey. Alexandria, VA: Society for Human Resource Management.

Sosik, J. J., Avolio, B. J., & Kahai, S. S. (1997). Effects of leadership style and anonymity on group potency and effectiveness in a group decision support system environment. Journal of Applied Psychology, 82(1), 89 - 103.

Sproull, L., & Kiesler, S. (1986). Reducing social context cues: Electronic mail in organizational communication. Management Science, 32(11), 1492 - 1512.

StataCorp. (1997). Stata statistical software: Release 5.0 Reference Manual. College Station, TX: Stata Corporation.

Straub, D. W., Limayemm, M., & Karahanna-Evaristo, E. (1995). Measuring system usage: Implications for IS theory testing. Management Science, 41(8), 1328 -1342.

Swanson, E. B. (1982). Measuring user attitudes in MIS research: A review. Omega, 10(2), 157 - 165.

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. Information Systems Research, 6(2), 144 - 176.

Tillquist, J. (1996). Participation on electronic bulletin board systems: An empirical analysis of work value congruency. Journal of Management Information Systems, 13(1), 107 - 126.

Valacich, J. S., Jessup, L. M., Dennis, A. R., & Nunamaker, J. F. (1992). A conceptual framework of anonymity in group support systems. Group Decision and Negotiation, 1(3), 219-241.

Walther, J. (1993). Impression development in computer-mediated communication. Western Journal of Communication, 57(4), 381 - 398.

Weil, M. M., Rosen, L. D., & Wugalter, S. E. (1990). The etiology of computerphobia. Computers in Human Behavior, 6, 361 - 379.

Zack, M. H., & McKenny, J. L. (1995). Social context and interaction in ongoing computer-supported management groups. Organization Science, 6(4), 394 - 422.

Zoltan, E., & Chapanis, A. (1982). What do professional persons think about computers? Behavioral and Information Technology, 1, 55 - 68.