

ELECTRONIC MAIL:  
ATTITUDES, SELF-EFFICACY,  
AND EFFECTIVE COMMUNICATION

by

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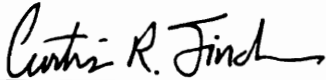
  
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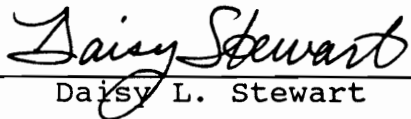
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(ABSTRACT)

The purpose of this study was (a) to investigate the functional use of e-mail in a university setting and the relationship of attitudes toward and self-efficacy with e-mail technology, and (b) to evaluate writing effectiveness in an electronic medium. The study also sought to determine if certain personal characteristics could serve as predictor variables for explaining e-mail use, attitudes toward e-mail, and self-efficacy with e-mail technology.

The population of interest was the teaching faculty at Virginia Polytechnic Institute and State University who had a published e-mail address. A random sample of 500 faculty were sent a survey via campus mail. A total of 262 usable responses provided data for statistical treatment which included factor analysis and multiple regression. Additionally, 30 self-selected respondents provided copies of e-mail messages they had written. These messages were rated holistically for writing effectiveness, and the

ratings were examined for their relationship with the extent of e-mail use, attitudes toward e-mail, and self-efficacy with e-mail technology.

The items on the attitude toward e-mail scale clustered into two factors, "Usefulness," and "Comfort/Anxiety." The items on the e-mail purposes of use scale also clustered into two factors, "Task Use," and "Social Use." These factors were similar to the ones on the instruments from which this study's instrument was adapted.

The results of the regression analyses indicated that several of the variables were significant predictors of e-mail use, attitudes toward e-mail, and self-efficacy with e-mail technology. An attitude of e-mail's usefulness and self-efficacy with e-mail technology were significant predictors of the extent of e-mail task and social use. Self-efficacy was a significant predictor of positive attitudes of usefulness and comfort. Age was a significant predictor of social use of e-mail as well as of a positive attitude of e-mail's usefulness. Years e-mail had been used was a significant predictor of the extent of e-mail use and of self-efficacy. Higher ranking teaching faculty had more positive attitudes of e-mail's usefulness.

The results of analyses of holistic ratings indicate no significant correlations existed among the variables. Recommendations for instruction and for further research are described.

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## Chapter One

### INTRODUCTION

"What hath God wrought?" was the first electronic mail message that Samuel F. B. Morse tapped out on his telegraph key on May 24, 1844. Exalting the first glimmer of the dawn of the information age, his prophetic question is far from being answered 150 years later. The evolution of electronic mail from early telegraph to Telex, Mailgram, facsimile, teletex, computer-based message systems, voice mail systems, and multi-media computer-mediated conferencing systems has been astounding, to say the least. This evolution viewed in the context of the gradual, but certain, progression toward an environmentally-desirable paperless society, rivets our attention on the issue of electronic literacy. Is society ready for computer-mediated communication?

To the average person, computer-mediated communication (CMC) means "e-mail," which is the colloquial and widely accepted term for the computer-based message system category of electronic mail. As it becomes commonplace in business, education, the military, and government, e-mail will become an equal, and perhaps more important communications partner than the telephone. Earlier estimates of electronic mail

traffic on the loosely knit international network, officially known as the Internet, placed the number of users at over 3,000,000 with a monthly growth rate of 10% (Carroll, 1992). The Electronic Mail Association estimated the number of public and private e-mail users to be over 9,000,000 (McCusker, 1993). A recent estimate by the Electronic Messaging Association, which represents 400 leading vendors of e-mail technology, says between 30 and 50 million people use e-mail with 16 million in the North American business sector alone (Leslie, 1994).

These millions of e-mail users are taking advantage of a wide variety of applications ranging from the informal social note sent to the office on the next floor to the journal article written collaboratively by scientists residing on different continents. The integration of e-mail facilities into various diverse software applications such as office groupware is becoming more common (Rapaport, 1991). The business community generally accepts electronic communication as convenient and very cost-effective and its wide variety of functions is a given for global connectivity (Hawkins, 1990).

Like the clock, the printing press, and the computer, the electronic network has the potential of being a technology that alters who we are as well as what we do. Communicating electronically in a global network will have

an irreversible impact on our work habits, our organization, and our basic patterns of communication. Electronic network literacy will soon equate with economic mobility.

Not only is the use of electronic networking growing exponentially in business and industry, but also school children are becoming frequent users of electronic communication. In just a few years, the number of K-12 students involved in networking has grown close to one million with a rate of increase of over 10% per year (Itzkan, 1992). Along with interactive multimedia courseware and portable, pen-based computers, computer networks will have the most profound impact on education (Press, 1993). According to Flatley (1992), it is becoming more important that today's business students learn the concepts and appropriate applications of e-mail technology than merely the keystrokes and procedures of e-mail software.

Since individuals react differently to using computers and computer technologies, the growth and acceptance of information technology has met with resistance in many schools and organizations. Computer anxiety may be as important a factor as lack of skills in this resistance to use of technology. According to Torkzadeh and Koufteros (1993), attitudes toward computer technology is a major factor in the effective utilization of the technology.

Along with criticism from business professionals that today's college graduates do not know how to work productively in teams, especially in an electronic environment (Wild & Winniford, 1993), studies have shown that teachers are not being prepared to function effectively with computer technology (Handler, 1993). Productivity in the online environment requires comfort with collaborative work habits and confidence with the available technology.

For those in the business of teaching communication skills, the implications of these numbers and the diversity of electronic communications are important. For if different or additional communication skills are necessary for effective use of this technology (Mitchell, Crawford, & Madden, 1985), those functioning in electronic environments without appropriate training or lacking self-efficacy (Hesse & Grantham, 1991) are working at a disadvantage. In addition to the traditional communication skills such as mastery of grammar, composition, and proofreading and editing skills, a person should be proficient in such areas as accessing databases during document preparation and synthesizing data and reports in an electronic media (Mitchell, et. al., 1985).

Electronic mail is characteristically similar to written, hard-copy, communication in that it is text-based and typically asynchronous (Kiesler, Siegel, & McGuire,

1984). However, the dissimilarities such as speed and perceived informality (Stein & Yates, 1983), as well as its ability to be easily transmitted to more than one "mailbox" (Rapaport, 1991) make it a distinct mode of communication. The skill requirements for communicating in this manner are quite different from other forms of communication (Roberts, Blakeslee, Brown, & Lenk, 1990). Also, the similarities between electronic mail and other traditional written media diminish when it is viewed as but one of several components of computer-mediated communication (CMC) as do Scovell (1991) and Rapaport (1991).

The potential usefulness of electronic mail must be considered in light of and balanced by its proclivity for fostering misunderstanding. Thus, traditional instruction for written business communication is quickly becoming outdated and may be even counter-productive for the successful information-based workplace of tomorrow. Even the manner in which student writing has been traditionally evaluated is suspect in this new medium. Perhaps an approach labeled "holistic" (Quellmalz, 1982), where more emphasis is placed on overall communication effectiveness, is better suited for the evaluation of the more informal writing that is prevalent in this milieu.

Many individuals do not feel confident about their skill with computer technologies. Research that examined

college students in various undergraduate disciplines suggests that in order to utilize computer technology productively, individuals must have a positive attitude toward computers as well as feel self-efficacious in using them (Kinzie, Delcourt, & Powers, 1993). Further, a number of studies have demonstrated variance in attitudes toward computers based on such demographic characteristics as gender (Dambrot, Watkins-Malek, Silling, Marshall, & Garver, 1985) and age (Loyd & Gressard, 1984). Gender differences in perceptions of computer self-efficacy were reported by Miura (1986).

Most of the literature related to electronic mail merely reviews anecdotal evidence of its popularity and its effectiveness for increased productivity. The literature concerning empirical research on electronic mail issues is quite limited. However, a research agenda in this area is beginning to become established as indicated by a few initial studies that have been reported.

Sherblom (1988) tracked the communication function of electronic mail and the direction of its flow through the organizational hierarchy in a large customer service operation. He established a useful method of coding the "function" or content of communication, classifying such categories as request for information, providing information, influence attempts, administrative

clarifications, and personal or social remarks. The results suggested that the characteristics of electronic communication change the very "complexion" of organizational communication. The hierarchial structure is supplanted by a matrix organization as communication becomes more lateral and less top-down in fashion. For education, this raises the question of potential impacts of electronic communication on the teacher/learner dynamic as well as on the educational institution's communication hierarchy.

The problem for business educators is how to develop instruction in the effective use of e-mail. Strategies for teaching electronic communication to secondary students, undergraduate pre-service teachers, and in-service teachers are not currently very well documented. Relevant variables such as computer attitudes, self-efficacy with computer technologies, and methods for evaluation of effective writing in this medium have been investigated individually but need to be studied in relation to one another. Before business educators can begin to develop instruction for e-mail skills, these more fundamental questions must be addressed. This study provides implications for integrating the use of e-mail technology into the communication curriculum.

Scovell (1991) compared CMC (e-mail) with non-CMC to measure differences in readability, level of sophistication,

and relative reading ease. A style-checker software program, Grammatik III, was used to generate the scores for statistical measurement. The admittedly superficial methodology resulted in fairly inconclusive findings. The stated implications for further study are, however, quite important. Scovell suggested the need for a larger sample, for a population that is from an organizational setting, and for written examples for comparison to be from the same population.

To observe e-mail use in a setting where the technology has been in place for some time and where the users are expert enough to provide a model for effective use would be especially beneficial for yielding implications for instruction. University faculty, who have used e-mail for as long as, and as productively as, any group would be a useful population to study. For prospective teachers, faculty who use e-mail productively would serve as a compelling model.

#### RESEARCH QUESTIONS AND PURPOSE

This study was designed to investigate and assess communication in an electronic environment within a specific professional work setting. First, the functional use of computer-mediated communication (e-mail) by university faculty was studied. What are the different patterns of e-mail use in a university setting and for what individual

purposes are educators using e-mail? Second, the relationship of e-mail usage, faculty attitudes toward computer technology, and levels of self-efficacy were examined.

Variables of the affective and behavioral domain are important predictors of individual differences in educational application, learning, and achievement (Francis, 1993). Complex behavior such as learning about and using computer technology can not be predicted without a knowledge of attitude and self-efficacy. Therefore, correlations between the use of e-mail technology and the affective factors became the focus of this investigation.

The following research questions were proposed for investigation in the study:

1. How is an individual's attitude toward e-mail technology related to different patterns of e-mail use?
2. How do self-efficacy ratings in e-mail technology relate to different patterns of e-mail use?
3. How does an individual's attitude about e-mail technology relate to self-efficacy?
4. Do relationships exist among demographic characteristics of respondents and different patterns of e-mail use, attitude ratings, and self-efficacy ratings?

5. How does the holistically rated quality of an individual's e-mail writing samples relate to patterns of e-mail use?
6. How is an individual's attitude toward e-mail technology related to holistic quality ratings of an individual's e-mail writing samples?
7. How do self-efficacy ratings relate to holistic quality ratings of an individual's e-mail writing samples?

The purpose of this study was to help educators improve communication in an electronic environment by broadening the understanding of key elements of e-mail usage. Through a comparative analysis of attitudinal and self-efficacy factors in relation to actual e-mail messages, a pragmatic appraisal of essential strategies for improved electronic communication was solicited.

Initial exposure to computer technology, inadequate training in understanding and using computers, and resistance to change and new technology have been cited as reasons to explain negative attitudes toward computers (Dambrot et al., 1985). The present investigation was designed to integrate findings primarily concerning these issues, as they relate to e-mail technology, into the larger body of research about computers in education.

Further, most prior research on computing in education has focused on the computer as a productivity tool or as an

instructional aid. The major lesson from the early Internet experience concerned the computer as an effective communication medium for educators. Although access to computational services for data analysis was thought to be the justification for widespread connectivity, communication in the form of information sharing has turned out to be the key benefit of computer networking (Schaefermeyer & Sewell, 1988). This study breaks new ground by investigating the relationship of this communication benefit with the attitudes of individuals actively involved in using an electronic medium.

#### LIMITATIONS OF THE STUDY

The following limitations applied to the design and execution of the study:

- (1) The sample for this study, the faculty at one university, limits the generalizability of the study. Inferences about e-mail communication issues at other universities or not-for-profit organizations must be made with some caution. Generalizations to other types of organizations should be avoided.
- (2) Data used for statistical analysis was limited to that collected from teaching faculty who use e-mail.
- (3) The e-mail writing samples were provided by individuals who were self-selected. This subset of the total sample may

be systematically different from the population limiting generalizations that can be made to the population.

#### DEFINITIONS OF TERMS

**Electronic mail** is non-interactive communication of text, data, or image between a sender and a designated recipient by systems utilizing telecommunications links (Flatley, 1992).

**Computer-mediated Communication**, often used synonymously with e-mail, includes accessing electronic bulletin boards, computer conferences, file transfer, and database service inquiries.

**Attitude** refers to a learned disposition to respond to an object in a consistently favorable or unfavorable manner (Igbaria & Chakrabarti, 1990).

**Self-efficacy** is an individual's personal perception of the ability to carry out actions (Hesse & Grantham, 1991).

#### ORGANIZATION OF THE STUDY

The research report is presented in five chapters. Chapter One sets the stage by defining the problem of the research study and stating the questions for investigation. Chapter Two presents the review of literature that was conducted to plan the conceptual framework, to justify the choice of variables and methodologies, and to identify areas

of needed research. Chapter Three describes the design, methodology, data collection procedures, and statistical analysis of data. Chapter Four recounts the primary research findings by describing outcomes of the statistical analyses of data. Chapter Five presents the conclusions and recommendations derived from the findings and data analyses reported in Chapter Four. Appendixes include the survey instruments, correspondence, and rater instructions.

## Chapter 2

### REVIEW OF LITERATURE

#### OVERVIEW

A review of relevant literature from a number of disciplines was conducted for the purpose of conceptualizing and refining the basic problem, justifying the choice of variables, and rationalizing the research methodologies. Studies are grouped into the following categories: (a) literature concerned with the patterns, or purposes, of electronic mail, (b) research relating to attitudes of individuals toward computers and computer technology, (c) research relating to self-efficacy with computer technology, (d) studies involving characteristics of e-mail communication, (e) research that outlines holistic evaluation of effective writing and (f) literature concerned with the demographics of e-mail users.

#### PATTERNS OF E-MAIL USE

Computer-mediated communication is used for almost as many purposes, serious and not so serious, as any other communication medium. Individuals share information, generate ideas, organize ideas, draft policies and procedures, collaborate on the writing of reports, share a vision, build consensus (Nunamaker, Dennis, Valacich, Vogal, & George, 1991) as well as share jokes, send humorous

messages, and exchange complaints about management (Compton, White, & DeWine, 1991). The international networks are even being used for political propaganda (Goodman, 1992).

Since little direct behavioral science research attention has been given to the question of how people use e-mail, the literature from various disciplines has been synthesized to formulate an approach for this aspect of the investigation. In addition to studies in the education arena, research in the areas of management, computer science, and communication theory yielded important clues. The underlying purpose of this section is to identify the magnitude of the dependent variable, e-mail use. Strategies for measuring this variable are also considered.

Education. While categorizing classroom uses of CMC in content areas such as language arts, social studies, and science education, Ruberg (1992), proposed that CMC can augment learning in a number of important areas. Successful instruction in an electronic environment enhances basic computer literacy skills, encourages positive student attitudes toward the technology, provides a new learning context, and introduces a global perspective. Important uses of CMC that are identified are student-to-student, student-to-teacher, and students-to-students writing; online database searching; and collaborative projects to conduct data collection, analysis, and discussion.

The widespread accessibility of the network has changed the way students and faculty communicate and conduct research. In an effort to gather information about the future of electronic communication in higher education, a Delphi study was conducted using a panel of 35 college faculty members from around the world who use CMC in teaching (Holden & Mitchell, 1993). The findings involve consensus on future applications and resources as well as the obstacles that must be overcome. The applications the panel considered likely to be available are of interest to the present study. These uses of electronic communication for which there was high and moderate consensus include distribution of class materials, answering study questions, sending and receiving student assignments, cooperative student work, distribution of grades, file transfer of assignments, and academic counseling.

Updegrave (1990) describes electronic mail use in higher education by faculty and administrators. Faculty use it in support of research, teaching, and administrative activities. Joint grant proposals, collaborative research projects, responses to conference solicitations, supervising thesis students while on leave, and keeping in touch with colleagues are carried out with the assistance of e-mail. Faculty members are also able to make, receive, and return assignments, and offer extended "virtual" office hours.

Administrators use e-mail to solicit comments on preliminary agenda, distribute briefing materials, and circulate minutes of meetings. E-mail serves those who must arrange meetings by permitting them to substitute group messages for round-robin phone calls. Accessing the national networks, administrators make data requests, conduct surveys of peer institutions, and plot strategies for dealing with government agencies.

Physical Science. To examine the statistical relationship between network use and scientific outcomes, multivariate regression techniques were used in a study that surveyed 338 SCIENCEnet users (Hesse, Sproull, Kiesler, & Walsh, 1993). A factor analysis of 17 questions related to the use of e-mail produced a six-factor solution. Three factors described the utility of e-mail for conducting joint work, staying in touch with the home office while traveling, and browsing to encounter new research information and people. The other three factors described different kinds of audiences for computer-mediated communication: (a) sponsors and government agencies, (b) professional committees in the discipline, and (c) editorial and agency offices to which scientists sent manuscripts and proposals.

Business. A content analysis of all the e-mail received by a middle level manager of a computer-communications services department of a large corporation

over the course of several months was undertaken by Sherblom (1988). The messages were coded for communication function, direction of communication within the organization, and for the presence of a signature. The communication function categories included requests for information, providing information, influence attempts, administrative items, and personal or social remarks. The results indicate that nearly 80% of the 157 messages analyzed involved informational functions but that all coded functions had at least a few occurrences.

Others have conducted studies concerned with the above categories but have classified them into more specific functions. A study conducted by Alexander, Helms, and Curran (1987) used an "administrative communication" category which included meeting announcements, requests to meet, acknowledgements, reminders, and minutes from past meetings.

Proponents of e-mail communication point to its speed in comparison with interoffice mail, courier service or postal mail (Sproul & Keisler, 1991), not to mention telephone calls that result in the ubiquitous pink slip rather than an immediate connection to the person being called. By accelerating the flow of information, electronic communication increases efficiency. More significant, however, is the ability to regularize information flow.

The most important organizational consequences of e-mail use stem from the fact that it makes group communication as easy as one-to-one communication. Describing how electronic communication increases efficiency, Sproul and Kiesler (1991), discuss how it is used for coordinating group work. Managers use e-mail for announcing or reiterating the time and place of upcoming meetings, and announcing and reiterating task assignments for both individuals and subgroups. Team members use e-mail to report task accomplishments; they also keep group members generally aware by producing summary messages and by forwarding messages of general interest to the entire group.

A comprehensive taxonomy of e-mail use was developed by Steinfield (1983) who examined communication activities by asking what people in an organization tried to accomplish through the use of e-mail. He hypothesized that task environment, perceived attributes, system access, and demographic characteristics affected the nature and extent of e-mail use. These four sets of independent variables used for his study were chosen from the literature of communication research. Most interesting for the present study, however, is the cluster of variables chosen for the dependent variable, the patterns of electronic mail use.

Steinfield used a combination of qualitative and quantitative methodologies in field research to uncover a

wide range of e-mail uses. The setting for his research was a large decentralized corporation that marketed a variety of office products. Over 2,000 users in six cities had used the organization's e-mail system which had been in place for seven years at the time of the research. Thirty-two individual items were culled from prior teleconferencing and e-mail research, interviews with users, and personal observations of uses of the mail system. The significance of this field study was the realization that simple typologies of e-mail applications based on existing literature could not adequately capture the complexity of usage. Table 1 provides Steinfield's (1983) list of the complete typology of e-mail uses.

#### SUMMARY OF PATTERNS OF E-MAIL USE STUDIES

The preceding discussion which examined settings in education, science, and business reveals a wide range of e-mail use. Professionals are using this technology to complement traditional communication media and to communicate in new ways, such as accessing national networks. In some instances, they are using e-mail to replace traditional communication, increasing speed and efficiency, especially of group work. The studies reviewed indicate use patterns that are unique to a discipline such as teachers counseling students; but, more importantly,

Table 1

Purposes of E-mail Use Items from Steinfield's Typology<sup>a</sup>

- 
1. Seek/send information from/to people I know
  2. Broadcast requests for information
  3. Distribute/provide information
  4. Give/receive feedback on reports/ideas
  5. Keep track of professional happenings
  6. Brainstorm/generate ideas
  7. Forward messages to someone who is not on some distribution list
  8. Discuss confidential matters
  9. Find out about job/promotion openings
  10. Keep a record of agreements/interactions
  11. Send a message in place of a phone call
  12. Get a message directly to someone whose calls are normally screened
  13. Keep in touch/maintain relationships
  14. Learn about events/things that interest me
  15. Get to know someone
  16. Participate in entertaining events (games) or conversations
  17. Schedule meetings/appointments
  18. Coordinate activities of a project
  19. Send a message requiring an immediate response
  20. Send a message requiring a response on the same day
  21. Organize/coordinate a social activity
  22. Carry on negotiations/bargain
  23. Take a break from work
  24. Fill up "free" time
  25. Resolve conflicts/disagreements
  26. Advertise/respond to products for sale
  27. Advertise/respond to rfp's
  28. Poll opinions on a topic
  29. Ask questions in a public setting (e.g. sending many copies) to force a response or action
  30. Monitor performance of a subordinate
  31. Send/receive pointers to large files
  32. Find out about job openings

---

<sup>a</sup>Respondents were provided the stimulus phrase "I use electronic mail to...". They circled a number ranging from 1=never to 5=very often. A "not applicable/ not something I do at work" option was provided and treated as missing data.

Note. From "Communicating Via Electronic Mail: Patterns and Predictors of Use on Organizations" by C. W. Steinfield, 1983, University of Southern California, Doctoral Dissertation.

indicate a proliferation of similar usage across various disciplines such as scheduling meetings and staying abreast of projects.

A variety of methodologies is reported in the studies including Delphi and other qualitative techniques, content analysis, factor analysis, and multiple regression. The quantitative approaches are most pertinent to this study. The dependent variable, e-mail use, as well as certain predictor variables used in the studies, such as perceived attitudes and demographic characteristics, will be key elements in the present investigation. Although the Steinfield (1983) instrument might be considered somewhat dated in a field as rapidly changing as computer-mediated communication, it is very thorough, and in general, inclusive of most facets of the dependent variable that are of interest in the present study. What is relevant for this study is not hardware or software issues, but communication issues. The literature does not suggest that new communication purposes have evolved in recent years.

#### ATTITUDES TOWARD COMPUTERS AND COMPUTER TECHNOLOGY

Behavioral scientists have long recognized the importance of the attitudinal dimensions of learning and achievement. For the past 15 years, a research agenda concerning attitudes toward computers has been firmly established in the literature (Francis, 1993). With the

introduction of the personal computer, user attitudes toward computers and the measurement of effects of computer technologies began receiving attention in various research disciplines (Mathews & Wolf, 1983). This attitude toward computers construct has been measured with a number of different scales from a variety of perspectives.

Francis (1993) has summarized the major studies concerned with attitudes toward computers that have appeared in the literature since the inception of the personal computer. The broad range of questions that have been investigated is distilled in the following listing: (a) the relationship between computer attitudes and locus of control, (b) the relationship of computer attitudes with sex, math anxiety, math aptitude, computer aptitude, and experience with computers, (c) the relationship between gender and computer attitudes, (d) the relationship between attitudes toward perceived usefulness of computers and computer experience, (e) comparisons of the attitudes of students and non-student working adults, (f) path analysis models of relationships between computer attitudes, computer experience, and cognitive ability, (g) the impact of a computer training course and computer attitudes, (h) the relationship between computer attitudes and personality traits, (i) the relationship between computer attitudes and computer literacy, and (j) the effects of educational

computing courses on pre-service teachers' attitudes toward computers.

From the preceding listing, studies that concerned perceived usefulness of computers, computer anxiety, computer experience, training, and the relationship of demographic variables, such as age and gender, were considered most pertinent for the present investigation. These will be examined for relevance of variables, methodology, and findings. In addition, studies that appraised and evaluated various measures of computer-related attitudes were reviewed.

Usefulness. How useful a computer is in a person's work will often determine the effort expended to overcome any initial difficulties with its use. A number of studies examined the construct of usefulness or utility in relation to attitudes (Byrd, & Koohang, 1989; Clement, 1981; Koohang, 1989). A questionnaire developed by Igarria and Chakrabarti (1990), contains a section which addresses the advantages and disadvantages of using a computer on the job. Questions focus on using the microcomputer to: (a) make better decisions after having access to higher quality information, (b) be more innovative by providing opportunity for more inventive evaluation, (c) enhance managerial image, and (d) obtain needed information more quickly.

A positive perception of the usefulness of computers depends on how well they are accepted in the workplace. Those who use a variety of programs such as word processing, spreadsheets, and computer programming languages have the most positive attitudes toward the usefulness of computers (Byrd & Koohang, 1989; Kinzie & Delcourt, 1991).

Experience using computers and computer technology is a common variable in studies concerned with attitudes. Igbaria and Chakrabarti (1990), found a negative correlation between experience and computer anxiety and a positive correlation between experience and attitudes toward computers of 187 part-time MBA students. Byrd and Koohang (1989), reported that undergraduate subjects presently using computers significantly expressed positive attitudes toward computer usefulness. From data gathered from 93 prospective business educators, Hignite and Echternacht (1992), found a positive relationship between computer attitudes and computer literacy.

Computer Anxiety. Since individuals react differently to using computers and computer technologies, the growth and acceptance of technology has been met with some resistance in many organizations. Computer anxiety may be as important a factor as lack of skills for this impediment to productivity. Before investigating the causes of computer

anxiety, the fundamental question, "What is computer anxiety?" must first be asked.

Recognizing that a clear-cut, universally accepted definition of anxiety does not exist, Torkzadeh and Angulo (1992), reviewed 30 years of research on the anxiety construct in general and computer anxiety in particular. They concluded that a situation in which an individual experiences stress when anticipating using a computer causes either computer tension (subliminal) or computer anxiety (conscious). Test and math anxiety are phenomena that somewhat resemble computer anxiety. External locus of control and an analytic cognitive style were also found to be highly correlated with computer anxiety.

Perspectives of computer anxiety were classified into three categories. The psychological perspective included individuals fearing a threat to their ego or a loss of power or influence. The sociological perspective involved the fear of not interacting with other people, and being unable to keep up with the technology. The operational perspective consisted of the fear of embarrassment connected with the inability to operate the computer or failure to understand the work procedures when computers are required to be used.

Igbaria and Chakrabarti (1990), surveyed 187 fully-employed, part-time MBA students at an eastern university. The stated purpose was to investigate (a) the relationship

of demographics, computer experience and training, system quality, and management support with computer anxiety and attitudes toward computers, and (b) the role of computer anxiety as a mediating variable influencing attitudes toward microcomputers. The attitudes toward computers scale involved the measurement of perceived utility and efficiency. The anxiety scale included questions about fears, stress, and confusion caused by computers.

Hierarchical multiple regression analysis was used to determine the relationships. The addition of computer anxiety to the regression equation that substantially reduced the regression coefficients of demographics, experience and training, and management support and system quality provided evidence of computer anxiety playing a mediating role.

Of the demographic characteristics, only gender was significant for computer anxiety and no demographic characteristics were significant for attitudes toward computers. All other variables were significant for both computer anxiety and attitudes toward computers. Table 2 summarizes these correlations.

Training. Although the relationship between training and attitudes is a well-established issue in human resource literature, according to Torkzadeh and Koufteros (1993),

Table 2

Pearson Correlations Between Computer Anxiety and Attitudes Toward Computers and Antecedent Variables (n=187)

Variables	Mean	S.D	Computer anxiety	Attitudes toward computers
Gender (1=M, 2=F)	1.32	0.47	0.15 <sup>a</sup>	0.06
Age	29.10	6.18	0.00	0.10
Education	4.90	0.63	0.12	0.06
Organizational level	1.67	0.87	0.01	0.10
Computer experience	4.43	1.12	0.28 <sup>c</sup>	0.26 <sup>c</sup>
Computer training	2.70	0.77	0.29 <sup>c</sup>	0.27 <sup>c</sup>
Management support	3.40	0.87	0.18 <sup>b</sup>	0.26 <sup>c</sup>
System quality	4.04	0.58	0.31 <sup>c</sup>	0.23 <sup>c</sup>
Computer anxiety	1.74	0.85	1.00	0.32 <sup>c</sup>
Attitudes toward computers	4.25	0.55	0.32 <sup>c</sup>	1.00

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

Note. From "Computer Anxiety and Attitudes Toward Microcomputer Use" by M. Igbaria and A. Chakrabarti, 1990, Behavior & Information Technology, 9, p. 233.

the relationship between training for computer technology and end-user attitudes has received little attention in management information systems literature. The authors investigated this question with undergraduate business students at two universities. The investigation focused on the change in attitudes toward computers that were the consequence of completing an introductory class for computers.

The results of the study indicated that five factors accounted for most of the variance. The factors with the most significant changes after the training were "positive reaction to computers," and "negative reaction to computers." The study suggests that computer training programs offered by the business schools involved tended to alter many students' attitudes toward computers. Although the results indicate some minor differences in gender attitudes including those toward computer-oriented services, the impact of the training applied equally to female and male students.

Measures of computer-related attitudes. A significant amount of research literature has been produced which investigates and measures the construct of computer anxiety. There seems to be no agreement regarding what it is the computer-related attitude scales set out to measure. Of

particular concern is the lack of a theoretical basis for a majority of the scales (LaLomia and Sidowski, 1993).

In the broad field of attitude research, an important debate continues between two schools of theoretic thought regarding the meaning of attitude. One school conceives attitudes as embracing three discrete aspects, the affective, the behavioral, and the cognitive. The other school contends that measurement of attitude should be in the affective domain only, that belief and behavioral intention should be measured separately (Francis, 1993). The scales that have been developed for measuring computer attitudes tend to combine the three dimensions.

In devising an instrument that measured attitudes toward computers and attitudes toward learning computer technology, Loyd and Gressard (1984), maintained that these attitudes play a role in the success or failure of new computer programs in schools. They developed what they called the Computer Attitude Scale which consisted of a 30-item Likert-type instrument that included statements regarding three principal types of attitudes: (1) anxiety or fear of computers; (2) enjoying working with computers; and (3) confidence in the ability to use or learn about computers. The participants in the study were 155 high school students enrolled in a computer-based program. The

coefficient alpha reliabilities for each of the three subscales were  $r = .86$  or higher.

The majority of computer attitude instruments focus on the more common uses of computers, such as word processing, and do not reflect the expanding field of computer technology. Functions such as compact disc data bases (e.g. ERIC, Psych LIT) and electronic mail are neglected in the research. Any investigation of electronic mail that addressed affective aspects would require instrumentation tailored to measure this domain.

Building upon a decade of research in the development of scales to measure attitudes toward computers, Kinzie and Delcourt (1990), developed a 19-item scale measuring Usefulness and Comfort/Anxiety with computer technologies. A rigorous review and critique process was followed leading to final revisions of the instrument. The resulting instrument was administered to 328 undergraduate and graduate students enrolled in education courses at six universities across the United States.

A principal component analysis of the 19-item Attitudes toward Computer Technologies instrument was used to identify three empirical factors which explained 52.3% of the variance among ACT items. Factor I contained eight items which loaded significantly. These items reflected "Comfort/Anxiety" in relation to computer technologies. The

11 items representing "Usefulness" loaded on Factor II and Factor III. These two factors were combined into one construct for two reasons. Factors II and III correlated moderately positively ( $r=.45$ ). Also, Factor II items are all positively phrased and Factor III items are all negatively phrased. These results provided evidence for retaining the two factor instrument ("Comfort/Anxiety and "Usefulness"). Alpha reliability for the ACT instrument was fairly high ( $r=.89$ ); as were the values obtained for reliability of the two individual conceptual factors ("Comfort/Anxiety,"  $r=.90$ ; "Usefulness,"  $r=.83$ ).

#### SUMMARY OF ATTITUDES TOWARD COMPUTERS STUDIES

The concern about attitudes toward computers and computer technology seems to have increased relative to the proliferation of this technology in society. Attitudes have been probed and measured from a wide variety of viewpoints, only some of which were deemed pertinent for this study. Research that examined usefulness, anxiety, training, experience, and the relationship of demographic characteristics was reviewed in the preceding section.

Usefulness and anxiety are the most commonly recurring themes in computer attitude studies since these two factors have the greatest effect on productivity with computer technology. The perceived advantages of computers in an information-intensive environment and experience with a

variety of programs influences impressions of usefulness. Training, experience, and managerial support have the most influence on anxiety which is characterized as threat to ego, embarrassment, or fear of decreased personal contact.

Most important for this study is that the research is evolving toward measuring attitudes about a specific technology, such as word processing, rather than a broad measure of attitudes toward computers in general. A person might be comfortable with using a computer, yet anxious when faced with using a particular software program such as electronic mail. This is especially true when the customary manner of communicating with others is changing because of the technology.

#### SELF-EFFICACY WITH COMPUTER TECHNOLOGY

The theoretical framework for examining self-efficacy with e-mail technology was constructed first by cognitive psychologists conducting research in the area of social learning theory and later by educational theorists investigating cognitive processes in the classroom. In general, self-efficacy refers to personal assessments of the ability to perform activities that are new and may be unpredictable and stressful (Bandura, Adams, & Beyer, 1977). Personal information about self-efficacy in a given domain comes from previous performance, accomplishments, vicarious observation, social persuasion, and psychological states

(Bandura, 1981). The principal idea underlying the research of self-efficacy in the classroom is that it is an important variable in understanding motivated learning (Schunk, 1985).

The impetus to acquire skills and knowledge, rather than merely completing classroom activities is the motivation teachers hope to instill in their students. Schunk (1985) created a model of motivated learning consisting of student characteristics, learning expectations, task engagement variables, and self-efficacy appraisal cues. Educational practices such as instructional presentation, performance feedback, goal setting, social comparison, and rewards are hypothesized to be important contextual influences on students' self-efficacy (Schunk, 1985). Even more than general attitudes toward a particular technology, perceived self-efficacy is related to the behavior required to produce specific outcomes with that technology. The effort and persistence needed to achieve success depends on an individual's confidence in a particular domain. According to the literature reviewed by Kinzie and Delcourt (1991), high correlations are often found between reported self-efficacy and subsequent performance.

In Kinzie and Delcourt's (1991) study involving 313 pre-service teachers, a 25-item Self-Efficacy for Computer Technologies (SCT) instrument proved to be highly reliable.

The questions involved perceptions of confidence using word processing, electronic mail, and CD-ROM databases. The SCT was subjected to a principal component analysis which yielded a three-factor solution which accounted for 84.4% of the variance. All three subscales had high reliability scores; the electronic mail subscale produced a  $r=.98$  alpha coefficient. Hierarchical regression analyses were undertaken to explore correlations between self-efficacy as a dependent variable and demographic variables, experiences in using computer technologies, and attitudes serving as independent variables. The results of these analyses indicated that taking a course in electronic mail, using electronic mail, and comfort/anxiety with computer technology were the most significant predictors of self-efficacy with electronic mail.

Miura (1988), conducted a study with 359 undergraduates to investigate the role of self-efficacy in predicting the likelihood of the students taking a computer science course and persisting despite difficulties encountered. Self-efficacy was measured with a scale that rated perceived confidence with computer programming, computer courseware, and personal use of computers. It is interesting to note that in Miura's study, self-efficacy is defined as confidence. Most of the studies mentioned in the foregoing section on attitudes include confidence as one aspect of

attitude (Byrd, & Koohang, 1989; Igarria, & Chakrabarti, 1990; Koohang, 1989; Kinzie, & Delcourt, 1991; Torkzadeh, & Koufteros, 1993). Perhaps the question of whether self-efficacy and the attitude of confidence are two distinct constructs should be left to the "angels-on-a-pinhead" counters.

A person's satisfaction with working in a networked organization depends on his or her sense of efficacy in negotiating the norms and mores of an electronically distributed community. Hesse and Grantham (1991), contend that telecommuters who reported being happy with telework are those that already felt confident in their abilities to work within the electronic environment. They expected positive feedback from employers who favor the telecommuting work arrangement. This confirms Bandura's theory that a sense of self-efficacy together with expectations of reward produces positive affect.

#### SUMMARY OF SELF-EFFICACY WITH COMPUTER TECHNOLOGY STUDIES

Closely related to the confidence aspect of the attitude construct, self-efficacy is the personal assessment of the ability to perform a new task. It is an important variable in understanding the motivation to learn. Since self-efficacy is more task-specific than confidence, it is of particular concern in electronic mail research which examines new ways of communicating as well as specific new

ways of computing. The research reviewed in the preceding section is important for the present study because it pointed out the close relationship between self-efficacy and attitude as well as the emphasis on the behavior required for success. Further, the multiple regression methodology used for observing correlation was used in this study.

#### CHARACTERISTICS OF E-MAIL COMMUNICATION

E-mail is introducing a new way of communicating. Writing about his e-mail correspondence with Microsoft chairman, Bill Gates, Seabrook (1993) says:

For years after the telephone was invented, in 1876, people thought it was a device that would transmit news, drama, and music: the idea that the telephone was a way to talk to other people took about twenty years to sink in...Similarly, today one hears about shopping, banking, and renting movies on the information highway...but the point of the information highway, it seems to me, is that it offers a new way of talking to other people. (49)

He suggests that new personal relationships will evolve in the future as people will meet on the network, exchange messages, "get to know the lining of each others's mind," then later meet face to face. The point is that people will be able to eliminate much of the "polite formalities that clutter people's encounters now, and say what they really mean." (p. 60)

The real time nature of e-mail allows writers to carry on a give-and-take conversation. This format is helpful in

collaborative work, and is therefore relevant to the team approach to problem solving (Nunamaker et al., 1991). Being faster than the letter and more precise than the phone call, e-mail is an effective tool in today's workplace (Flatley, 1992).

An investigation of effective communication in an electronic mail medium must include a discussion of the primary issues in writing using e-mail as the delivery system versus writing using more traditional delivery systems. In order to evaluate the quality of e-mail messages fairly, the medium must be accepted, as the literature suggests, as a distinct model for communication rather than merely as an electronic version of a typed document.

Generally, text composed on the computer differs from printed text and reading it calls for a new relationship between the reader and the text. Costanzo (1989) contends that electronic text is "less sequential, more hierarchial, less continuous, more modular, and perhaps less rigorously developmental..." (p. 61) Even the spatial qualities of electronic text challenge the reader in new ways. The most significant distinction between the printed page and the screen is the amount of text that can fit legibly on a single page versus a single screen (Hartley, 1987). A typical screen displays 20 lines of text, each containing 80

characters. A single page in a printed journal article might require four screenfuls on a computer's monitor.

In practice, e-mail seems to lie somewhere between face-to-face and written communication. When compared to face-to-face communication, e-mail gets to the point sooner, reflects more time for composition, is less inhibited. When compared to hardcopy communication, e-mail is less formal, more succinct, and more spontaneous (Hesse, Werner, & Altman, 1988). In another view, e-mail has been described, in comparison to face-to-face communication, as "more concise, logical, direct, organized, careful, functional, serious, businesslike, depersonalized, task-oriented, and less emotional, friendly, informal, personal, relaxed, and spontaneous" (Compton, et al., 1991, p. 26).

Two characteristics of computer-based communication--plain text and perceived ephemerality of messages--make it relatively easy for a writer to ignore the audience. This reduction of social awareness leads to messages that ignore traditional boundaries, are more characterized by self-revelation, and contain more candid remarks (Sproull & Kiesler, 1991). When an individual composes at the keyboard, the writing often exhibits some of the flaws of spoken language such as verbosity, repetition, and disorganization (Costanzo, 1989). Writing tone involves the choice of language and how appropriate it is for the

audience, the subject, the purpose, and the context of the communication. Many e-mail messages tend to be informal despite the topic. This is because it is, or at least has been, the province of a counterculture favoring informality. E-mail is to the written memorandum what blue jeans are to pin-striped suits.

Because of the differences in e-mail communication, it has some special needs that messages in other media do not have. Recipients will sometimes decide whether to read messages based on the subject line. This requires that the subject line "clearly conveys both content and priority" (Flatley, 1992). Since typical e-mail users are unlikely to scroll through multiple screens, messages should get to the point quickly. A journalistic style of organizing with information ordered from most important to least important is appropriate.

Also, formal writing is constrained by the unfriendly user interface of many e-mail systems. Perhaps the biggest drawback of e-mail is the intimidation of novice users. The writing environment is often not user friendly, and system problems "such as downtime or message transmission glitches decrease reliability and decrease usage" (Komsky, 1991, p. 315). Whether this situation is improving with more recent software such as POPmail is an area of needed research. The experience for many new users,

however, is one of confusion and frustration. The act of getting the message mailed is such a challenge that writing style considerations are a low priority. In one study, user sloppiness due to a lack of proofreading and editing was found to be a major disadvantage of e-mail (Schaefermeyer & Sewell, 1988). After the system is mastered, however, the quality of messages can be improved if the time saved as a result of the quick transmittal of messages is used to check and revise the message (Flatley, 1992).

Other important issues for e-mail involve the change in communication patterns. Since important non-verbal and contextual information is missing, disinhibited behavior can sometimes result. This can allow for more candid communication; however, in the context of a frustrating event, aggressive tendencies arise. In the e-mail culture, the term "flaming" is used to describe this type of aggressive and heated verbal exchange (Kiesler et al., 1984). Although many professionals frown upon their use, "Emoticons" and "comments" are popular conventions to express feelings or attitudes and avoid misunderstanding. An example of an emoticon is the use of a hieroglyphic such as the smile [ :) ] (view sideways) to denote a happy face. A typical e-mail "comment" such as a [ <grin> ] is an attempt to provide clues that are called non-verbal in oral communication (Flatley, 1992).

More important is the change of communication patterns at the organizational level. Decision making is influenced by giving greater voice to minority input. In a group situation that is not face-to-face, the dominant personality is not as easily asserted. All messages are equal in the sense that the writers are more anonymous (Keisler et al., 1984). Also, since anyone can send a message directly to anyone else, the hierarchial structure of an organization becomes replaced by a matrix structure as communication becomes more lateral and less top-down (Sherblom, 1988). New management styles recommend organizational leveling and therefore find this e-mail convention acceptable.

#### SUMMARY OF STUDIES RELATED TO E-MAIL CHARACTERISTICS

The distinct characteristics of written communication with e-mail summarized in this section become an integral part of the discussion about successful exploitation of the medium. Simply, it is not merely a technology issue, but an inter-personal communication issue as well. Composition variables such as writing tone and style become as important as technical variables such as computer screen size and software intricacies. Research in organizational communication also becomes part of the context. Since the present study is investigating relationships between attitudes, self-efficacy, and effective communication, the predominantly qualitative research findings about

communication variables provide the conceptual foundation for the discussion of holistic evaluation which follows.

#### HOLISTIC EVALUATION OF EFFECTIVE WRITING

In general, empirical research in written composition has taken two approaches to the question of what constitutes quality, examining errors and syntactical features. Neither approach is entirely satisfactory and neither has provided specific directions for the teaching of effective writing (Witte & Faigley, 1981). In the area of electronic communication, numerous studies have investigated the question of whether writing on computers produces better quality composition than writing by hand. Quality of a written piece is typically measured based on the number of errors found and on syntax or specified subjective criteria.

Pearce and Barker (1991) compared college students' reports written by hand and on the computer. They judged the quality of the reports based on four criteria for "grammatical errors" (capitalization, punctuation, spelling, and vague adverbs); and based on six "writing errors" (readability, passive construction, use of prepositions, trite expressions, wordy expressions, and redundant expressions). The asserted results of the study did not support an inference that basic writing quality will improve when a computer is used. The researchers suggest that the confounding results of previous studies--some of which found

computer-assisted writing to improve quality and some of which found antithetical results--may be due to imprecise measuring devices.

Collier (1983) addressed the problematic issue of writing evaluation:

Teachers, rhetoricians, writers and psychologists might all object that it is impossible to measure either writing skills or creativity. And perhaps rightly so. It is doubtful if consensus could be achieved among the experts about matters so elusive, mysterious and subject to the vagaries of personal taste as what makes for excellent writing skills. (p. 9)

The measurement difficulty partially derives from the behavioral science adoration of the methodology of the "hard" sciences such as chemistry and physics. Collier (1983) debunks some of the work of science:

In these disciplines, despite the warnings of quantum mechanics that the observer and the observed are interlinked, that observations may ineluctably alter that which is being observed, and unexplained irrationalities in the very small and the very large may exist, the scientific method reigns absolute. (p. 10)

In disciplines such as sociology, psychology, and linguistics, plausibility is less than robust when the empirical method of hard science is applied to human activity. Rhetoric has suffered somewhat from this "scientistic" approach where specious quantification replaces a needed humanistic procedure.

In recognition of the difficulty of quantifying measures of writing ability, an approach to evaluation of composition that has gained credence in recent years is one that has been termed "holistic." This method is impressionistic, using a large group of evaluators who are familiar with assessing writing, who practice with particular scales, and who eventually attain a fairly high interrater reliability score.

Quellmalz (1982) has developed a scale for evaluating expository writing which provides separate 6-point rating scales for general impression of the quality of an essay, general competence, coherence, paragraph organization, support for main ideas, and mechanics. This impressionistic scoring allows a rater to make a judgement on the overall quality of a piece of writing:

The purpose of Impressionistic Rating is to form a single impression of a piece of writing as to how well it communicates a whole message to the reader. Impressionistic scoring assumes that each characteristic that makes up an essay--organization of ideas, content, mechanics and so on--is related to all other characteristics. Impressionistic scoring further assumes that some qualities of an essay cannot easily be separated from each other. In short, the procedure views a piece of writing as a total work, the whole of which is greater than the sum of its parts. (p. 6)

The scale synthesized several strategies of general impression and analytic scoring. Reliability data were collected from controlled research in which several hundred raters had scored over 10,000 essays. After a training

session, coefficients of reliability ranged from .89 to .91 on the subscales.

A recent meta-analysis of studies of students' writing using word processors included 28 studies that obtained holistic measures of writing quality (Bangert-Drowns, 1993). An example of this research is a study conducted by Etchison (1985), comparing college level compositions. One group of students produced essays that were handwritten and the other group produced essays that were written using a word processor. Raters using holistic scoring methods were graduate students in the Rhetoric and Linguistics program who were trained for approximately one hour before the rating sessions. Two raters were used for each writing task to be evaluated and a third rater was used to arbitrate where the original raters disagreed on more than one point. The interrater reliability for the holistic scoring of the writing samples ranged from .75 to .84.

#### SUMMARY OF HOLISTIC EVALUATION OF WRITING STUDIES

How to measure quality in writing is a question that has resulted in endless academic arguments about trying to quantify the unquantifiable. Quality is subjective. The measurement of "correct" syntax or other arbitrary criteria of writing is problematic; even agreement about what constitutes a grammatical "error" is sometimes debatable.

Yet a seasoned writer or reader can tell good writing from bad.

Judging writing effectiveness in a non-traditional medium such as e-mail is doubly difficult. Therefore, the impressionistic or holistic approach to writing evaluation discussed in the preceding section is especially appropriate for the present study. The brief, informal, concise nature of the typical e-mail message makes holistic evaluation more fitting than attempting to judge separate qualities of a written piece. The impression concerns, basically, how well does the writer communicate the message to the reader, how well does language work for the task.

#### DEMOGRAPHIC VARIABLES

Gender. A considerable body of literature reports gender differences in attitudes toward computers. Shashaani (1993) reviews numerous studies that found the differences begin in the early school years and persist throughout high school and college years. Male and female differences mostly realized with respect to self-confidence where males rate higher (Shashaani, 1993), and anxiety where females rate higher (Igbaria, & Chakrabarti, 1990). While researchers strongly agree on the presence of sex differences in attitudes toward computers, there is little agreement on the causes of this gender differentiation.

Every study reviewed in this chapter's previous sections on attitudes and self-efficacy included gender as a variable. Significant difference was indicated for both variables without exception. More interesting for this study is the effect of gender for quality of writing e-mail. Little research has focused on demographic variables that explain differences in writing quality (Pearce, & Randolph, 1991).

Age and Experience. Age is a variable familiar to social scientists, almost always included when personal characteristics are under consideration. A person's age is generally found to be inversely related to computer-mediated communication system use (Steinfeld, 1983). Younger people have had more exposure to computing and are typically less threatened by new ways of doing things. This generally accepted premise may soon change as computers are in use more commonly and are being used by more people. Further, interpreting the importance of this variable when it is reported in studies is difficult when the age range is not mentioned.

It is not surprising that experience with computers is a significant variable in the majority of research about attitudes and self-efficacy. The amount of prior experience with electronic mail should influence the amount of use whether for task or non-task purposes (Igbaria, &

Chakrabarti, 1990; Kinzie, & Delcourt; Koolang, 1989; Steinfield, 1983). Whether experience with e-mail affects writing quality has not been addressed in the literature and should be an interesting finding in this study.

#### SUMMARY OF STUDIES OF DEMOGRAPHIC VARIABLES

Personal characteristics such as gender, age, and experience with computers are typical variables in studies about computer use and computer attitudes. Generally, these variables are found to be significant. In research concerning writing on computers, however, these characteristics are usually not considered. For the present study, which will attempt to add to existing knowledge about the relationship of attitudes with specific computer technology and with writing on a specific computer medium, the demographic variables will be important to consider.

#### SUMMARY

Research in the area of e-mail use, attitude toward computers, and self-efficacy with computer technology discuss common themes, and generally, employ similar quantitative methodology. Research concerning e-mail characteristics, and research concerning the evaluation of writing focus on entirely different issues, and typically employ qualitative approaches. Studies concerned with a combination of all the variables relevant to this study are virtually non-existent. The preceding literature review

discussed the theoretical concepts, the variables, and the methodologies that will be synthesized for the present study. If the effective use of e-mail is to be part of the school curriculum, teachers and instructional designers will rely on the research to help them understand the relationships and implications discussed in this chapter. Chapter Three will delineate the procedures based on the findings of the literature review.

## Chapter Three

### PROCEDURES

The purpose of this study was to broaden the understanding of e-mail communication. It was designed to investigate and assess the functional use of e-mail in a university setting and the relationship of attitudes toward and self-efficacy with e-mail technology. This chapter delineates the design of the study, the population sampled, the instrumentation, the data collection procedures, and the statistical analysis. The seven research questions were answered through procedures detailed in this chapter. The questions follow:

1. How is an individual's attitude toward e-mail technology related to different patterns of e-mail use?
2. How do self-efficacy ratings in e-mail technology relate to different patterns of e-mail use?
3. How does an individual's attitude about e-mail technology relate to self-efficacy?
4. Do relationships exist among demographic characteristics of respondents and different patterns of e-mail use, attitude ratings, and self-efficacy ratings?

5. How does the holistically rated quality of an individual's e-mail writing samples relate to patterns of e-mail use?
6. How is an individual's attitude toward e-mail technology related to holistic quality ratings of an individual's e-mail writing samples?
7. How do self-efficacy ratings relate to holistic quality ratings of an individual's e-mail writing samples?

#### THE DESIGN

The research design for this study is an ex post facto design. Kerlinger (1973) explains:

Ex post facto research is systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relations among variables are made, without direct intervention, from concomitant variation of independent and dependent variables. (p. 379)

Although ex post facto research lacks the control of experimental research and is somewhat limited because of the inability to manipulate independent variables, Kerlinger (1973:391) states that a considerable amount of ex post facto research must be done in the behavioral sciences such as psychology, sociology, and education because many research problems in these disciplines do not lend themselves to experimental inquiry. The questions addressed

in the present study are not appropriate for an experimental approach. The affective variables of interest, attitudes and self-efficacy, could not be manipulated, nor could external variables be controlled. A degree of control has been gained, however, for the sake of validity, through subject selection and statistical analyses.

### THE SAMPLE

The population of interest for this study was the teaching faculty at Virginia Polytechnic Institute and State University (VPI & SU) who had e-mail addresses published in the 1993-94 campus directory. From an electronic database of all teaching faculty ( $n = 2,100$ ), a list of those with a published e-mail address was compiled ( $n = 1,400$ ). A random sample of 500 teaching faculty with an e-mail address was chosen to be surveyed; this number was based on a formula for determining sample size and representative response (Wunsch, 1986). In order to control for availability of access to the e-mail system, only faculty who indicated that they use the system were included in the statistical analysis.

In addition to responses regarding e-mail use, attitudes toward e-mail technology, self-efficacy with e-mail technology, and demographic information, the faculty surveyed were asked if they would be willing to provide

sample e-mail messages that they had written for the purpose of document analysis. Specifically, the respondents were asked if they would send to the researcher copies of all their non-personal e-mail for a period of one week. From the group that agreed to this request, 30 e-mail users submitted documents for analysis in this segment of the investigation.

Virginia Polytechnic Institute and State University was selected for the study as it is a typical large institution of higher education with a representative faculty composition. It has over 20,000 students and 2,100 faculty.

Another important consideration for choosing this site for sampling was based on the relative expense and effort required for the collection of data. Time and travel costs were minimal due to the close proximity of respondents. Most important, however, was the fact that e-mail technology has been in use for over 10 years at this institution, and a large number of the faculty use e-mail, many of them extensively.

#### INSTRUMENTATION

The survey instrument consisted of four major sections from which the measurement of variables was obtained. The independent variables chosen for the study were as follows: (a) attitudes toward e-mail technology, (b) self-efficacy with e-mail technology, (c) demographic characteristics such

as age, gender, number of years in teaching, rank, and number of years e-mail has been used, and (d) holistic effectiveness ratings of e-mail communication. The dependent variables, the uses of e-mail, were categorized according to essential function of use. These included task or social use, and level of use, namely light, moderate, or heavy use. For the document analysis portion of the study, two measurements were used: (a) the software program Grammatik 5 was used to determine a readability score, and (b) a panel of experts assigned holistic ratings to determine an effectiveness score.

#### Attitudes Toward E-mail Technology Scale

Since teachers who use computer technologies will serve as models for their students, they should help foster positive student attitudes toward these useful technologies. For this positive modelling to occur, the teachers must themselves feel comfortable using computers and must perceive the utility of computer technology in their work. The first research question, which addressed this issue of comfort and utility, is as follows:

- 1. How is an individual's attitude toward e-mail technology related to different patterns of e-mail use?**

Two instruments were developed to collect data needed to answer this question. Each was a refinement of existing instruments.

Kinzie and Delcourt (1991) have developed a scale to measure individual attitudes toward computer technologies (ACT) which synthesizes and augments the research that has been done in this area over the last 15 years (Kinzie, Delcourt, & Powers, 1993). Author permission was obtained to use the scale and to make appropriate revisions. The general phrase "attitude toward computer technology" was changed to "attitude toward e-mail technology" and minor changes in wording were made to a number of items to make the questions more appropriate for a professional audience. A final statement regarding e-mail technology as an "overrated tool for productivity" was added. A number of the original questions were eliminated based on recommendations of an expert review panel. This panel was composed of three experts consisting of a business education researcher with over 30 years of experience, a professor of behavioral science methodology, and a director of a university research and measurement office. A concern for response rate dictated the use of a shorter survey.

The original instrument contained 19 items, 11 items measuring Usefulness (for example, "Communicating with others over a computer network has made me be more effective in my work") and eight items measuring Comfort/Anxiety ("I feel comfortable about my ability to work with e-mail technology"). The phrasing of the statements was balanced

equally between positively and negatively phrased statements, as recommended by Likert (1932).

After administration to 328 university students, the developers of the instrument used a principal component analysis of the 19-item ACT instrument to identify three empirical factors which explained 52.3% of the variance among ACT items. Factor I contained eight items which loaded significantly. These items reflected "Comfort/Anxiety" in relation to computer technologies. The 11 items representing "Usefulness" loaded on Factor II and Factor III. These two factors were combined into one construct for two reasons. Factors II and III correlated moderately positively ( $r=.45$ ). Also, Factor II items are all positively phrased and Factor III items are all negatively phrased. These results provided evidence for retaining the two factor instrument ("Comfort/Anxiety and "Usefulness"). Alpha reliability for the ACT instrument was fairly high ( $r=.89$ ); as were the values obtained for reliability of the two individual conceptual factors ("Comfort/Anxiety,"  $r=.90$ ; "Usefulness,"  $r=.83$ ).

As a result of these analyses, the authors imply that construct validity is assured and the scale may be used without much reluctance. They state that although the instruments were designed for administration to secondary teachers and teacher education students, they can easily be

adapted for use with other specialized population groups, such as those from business or medicine. A copy of the adapted scale may be found in Appendix A.

The first research question concerned the relationship of these attitudes toward e-mail and different patterns of e-mail use. These patterns were determined by means of a scale developed by Steinfield (1983). Respondents were asked to appraise on a 5-point scale the extent to which they use electronic mail for particular tasks. The scale ranged from never (1) to very often (5). In addition, to avoid having respondents rate items for tasks they do not do even by other media, a not applicable category was provided. Eighteen individual items were used based on the literature discussion in Chapter Two, from personal observations of e-mail use, and a survey review by a panel of experts whose major recommendations included a culling of minor, inappropriate, and redundant items. Table 3 provides a listing of the resulting e-mail uses to be surveyed. A copy of the adapted scale may be found in Appendix A.

Following data collection, a number of items were removed from the list after initial analysis indicated low frequency or missing cases. In general, when e-mail was not used for some purpose, or the frequency was so low on a particular use as to hinder further analysis, it was removed. The remaining items were then factored to disclose

Table 3

Purposes of E-mail Use Items<sup>a</sup>

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1. Send information to people I know
  2. Seek information from people I know
  3. Broadcast requests for information
  4. Distribute/provide information
  5. Give/receive feedback on reports/ideas
  6. Brainstorm/generate ideas
  7. Monitor progress of projects on which I work
  8. Send/receive assignments to/from students
  9. Keep in touch/maintain relationships
  10. Learn about events/things that interest me
  11. Participate in entertaining events or conversations
  12. Schedule meetings/appointments
  13. Coordinate activities of a project
  14. Organize/coordinate a social activity
  15. Take a break from work
  16. Resolve conflicts/disagreements
  17. Advertise/respond to RFPs
  18. Poll opinions on a topic
  19. Resend the same message to a person who may have missed  
it the first time
  20. Send messages from a home computer
- 

<sup>a</sup>Respondents were provided the stimulus phrase "I use electronic mail to...". They circled a number ranging from 1=never to 5=very often. A "not applicable/ not something I do at work" option was provided and treated as missing data.

a set with fewer dimensions of e-mail uses. Results of the factoring are presented in Chapter Four.

### Self-efficacy with E-mail Technology Scale

As with the use of any technology, a person's perception of competence with computer technology reflects on his or her ability to perform the behavior required to produce specific outcomes. In order for a teacher to produce positive student perceptions of competence with e-mail technology, the teacher, as a model, must feel self-efficacious using the technology. The second research question, which addressed this issue of self-efficacy, is stated as follows:

**2. How do self-efficacy ratings in e-mail technology relate to different patterns of e-mail use?**

Two instruments were used to collect the data needed to answer this question. The Steinfield E-mail Purposes of Use instrument (1983) served to collect data for the dependent variable. This scale is discussed in the previous section concerning attitudes toward e-mail technology. The data are used similarly with the self-efficacy variable as with the attitude variable.

Kinzie and Delcourt (1991) have developed a scale to measure individuals' perceived self-efficacy for computer technologies (SCT). The scale is designed to assess teacher education students' and practicing teachers' self-efficacy

for word processing, electronic mail, and CD-ROM data bases. Author permission having been obtained, the section of the instrument pertaining to e-mail technology as the core items in an augmented scale was used for this study. Based on personal experience of the researcher in instruction of e-mail technology, five additional items were added to the scale. A copy of the adapted scale appears in Appendix A.

The electronic mail section of Kinzie and Delcourt's self-efficacy scale contained nine items that addressed basic functions of e-mail use. Respondents were provided the stimulus phrase "I feel confident...", followed by statements such as "Logging on to e-mail," and "Sending the same mail message to more than one person on e-mail." The items that were added to the scale reflect more advanced functions such as signing on to listserves/discussion groups and uploading files to and downloading files from the e-mail environment.

Using only one section of a three-section scale that included word processing, electronic mail, and CD-ROM data base was deemed appropriate since self-efficacy is considered to be task specific (Schunk, 1985). The measures of self-efficacy with regard to specific performances are more important than an attempt to measure a global construct. In fact, during the development of the SCT, Kinzie and Delcourt noted significant factor loadings

generated by Varimax and oblique rotations. Also, using Kaiser's criterion, a Principal Component Analysis revealed a three-factor solution accounting for 84.4% of variance in the total set of 25 items for 313 respondents. Further, intercorrelations between Factor I (word processing) and Factor II (electronic mail) of  $r=.42$ , and Factor II and Factor III (CD-ROM data base) of  $r=.41$  indicate low to moderate positive relationships between the factors. Since, by definition, measures of self-efficacy are task specific, keeping these three factors separate is conceptually preferable. The internal consistency reliability (alpha) estimates was .98 for the electronic mail factor of the original self-efficacy scale.

A final point about the self-efficacy scale needs explication for the third research question of this study which is stated as:

**3. How does an individual's attitude about e-mail technology relate to self-efficacy?**

Kinzie and Delcourt developed the SCT scale together with the ACT scale discussed in the previous section to assess, among other effects, the relationship between attitudes and self-efficacy. When self-efficacy for electronic mail was used as a dependent variable in a regression equation, attitude subscales explained a significant amount of

additional (after demographics and experience) variance in the prediction of self-efficacy.

Research question 2 concerns the relationship of these self-efficacy ratings and different patterns of e-mail use. The instrument for measuring these patterns was discussed in the section on attitudes toward e-mail technology. The complete survey instrument appears in Appendix A.

### Demographics

For the fourth research question, data were obtained pertaining to personal characteristics of e-mail users. The research question is:

**4. Do relationships exist between demographic characteristics of respondents and different patterns of e-mail use, attitude ratings, and self-efficacy ratings?**

Information concerning the respondent's age, number of years in teaching, gender, rank, and number of years that e-mail has been used was obtained through the final items on the survey which appears in Appendix A.

The content validity for these items was substantiated from what the research literature in this area establishes as predictor variables. Age and gender are two independent variables that are examined almost universally in computer attitude and self-efficacy studies. Several studies cite years in teaching or years on a job as well as number of

years at an organization as correlates with attitudes as well as with patterns of use. The manner in which the use of computer technology is learned and how it relates to attitudes and use is mentioned in a number of studies. Full discussion concerning these variables can be found in Chapter Two in the section relating to attitudes toward computers.

### Holistic Effectiveness Scale

For the fifth, sixth, and seventh research questions that address the issue of holistic effectiveness ratings, data were collected from the actual e-mail messages written by a subset of the larger survey sample. The three research questions are stated as follows:

- 5. How does the holistically rated quality of an individual's e-mail writing samples relate to patterns of e-mail use?**
- 6. How is an individual's attitude toward e-mail technology related to holistic quality ratings of an individual's e-mail writing samples?**
- 7. How do self-efficacy ratings relate to holistic quality ratings of an individual's e-mail writing samples?**

Respondents to the general electronic mail survey were asked if they would be willing to participate in a second phase of the study. They were requested to indicate "YES" if they would be willing to send copies of all their non-personal e-mail for a period of one week. The document

analysis process that would be used was explained and guarantees of confidentiality were extended. For those who indicated that they would participate, further instructions were sent in subsequent e-mail correspondence from the researcher.

The 30 participants were instructed to add the researcher's e-mail address to the "copies to" option of the e-mail messages they sent during the one week. The copies of the messages received were each saved in a separate file (notebook) that had been created for each participant. For each of the 30 participants, 2 messages of between 100-300 words were chosen for analysis. The e-mail header information was stripped from the e-mail messages so the body of the message would be the only text being analyzed. To maintain confidentiality, all proper names were replaced with "John Doe," and any specific places or events were recoded to maintain the confidentiality of the sender's message.

Six postsecondary instructors of business communication each independently rated the documents for communication effectiveness. The researcher had previously trained these six raters in the use of the holistic measurement. The collected documents were assigned representative numbers, 1 through 60. Numbers were randomly generated and assigned to the six raters who were instructed to rate the documents

using a scale modelled after the Scale for Evaluating Expository Writing developed by Quellmalz (1982). This is a holistic/analytic instrument that has six-point scales for assessing four dimensions of writing--competence, focus/organization, support, and mechanics. These dimensions of the adopted scale are defined in Table 4. The evaluation guide is provided in Appendix B.

Three raters scored copies of the same 30 messages; the other three raters scored copies of the 30 other messages. Therefore, each of the 60 messages was scored by three different raters. This approach was taken so interrater correlation could be analyzed for scoring reliability. The results of this analysis are given in Chapter Four. The documents were also rated with the help of Grammatik 5 software which generated a readability score. This software program generates a Flesch Reading Ease score (Grammatik 5 User's Guide, 1992). The lower the score, on a 0 to 100 scale, the more difficult the writing is to read.

#### FIELD TEST OF INSTRUMENT

A panel of three experts consisting of a business education researcher with over 30 years of experience, a professor of behavioral science methodology, and a director of a university research and measurement office examined the instrument and made a number of recommendations. The major weakness was the excessive length of the original

Table 4

Scale for Evaluating Effective Writing

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Subscale	Definition
General competence	The overall, or holistic, impression of a piece of writing as to how clearly it communicates a message to the reader.
Focus/organization	The extent to which the topic is clearly indicated and developed in an organized manner.
Sentence structure	The skillfulness of sentence construction (coherent, unified, and effectively varied).
Mechanics	The extent to which grammar, punctuation, and spelling interfere with the writer's effectiveness in communicating.

---

instrument. Also, a number of items were felt to be inappropriate for the intended respondents. The panel expressed concern that response rate might suffer on account of these weaknesses. Based on this input from the panel, the instrument was reduced from 80 items to its current size of 60 items. The panel also suggested that the survey items be printed on an OPSCAN form.

The original longer version and the shortened version of the instrument were field tested with 12 respondents for each version. The response rate for both tests was the same (n=5). Six respondents were interviewed to see whether the survey questions and the answer scale was clear and easy to understand. No problems were indicated. A reliability coefficient was ascertained for each field test. The results were  $r = .84$  for the longer test and  $r = .79$  for the shortened test. These reliability scores were deemed acceptable considering the low number of respondents, and the shortened survey instrument was chosen to be used for the study.

#### SURVEY PROCEDURE

The survey was sent via campus mail to the 500 faculty who were chosen randomly. Four weeks later, the survey was again sent by campus mail to all non-respondents. After three weeks, a randomly chosen 10% of the remaining non-respondents were contacted by phone and asked for their

response on a number of the key survey questions. In other words, three separate groups, or waves, were documented for the purpose of determining sample representiveness. The results of the analysis comparing key variables for the three waves can be found in Chapter Four.

#### ANALYSIS OF DATA

The three primary statistical tools used to analyze the data were factor analysis, multiple regression, and a correlation matrix. The findings from these three analyses allowed the researcher to describe the relationships that exist among the variables and to use the known correlations to predict from one variable to another. To analyze the intercorrelations among the large set of measures in the attitudes, self-efficacy, and patterns of use part of the survey instruments, factor analyses were performed to identify a smaller number of common factors. Identifying the pattern of relationships that exist among the variables, multiple regression analyses were used to predict the effect of attitude, self-efficacy, and demographic characteristics on patterns of e-mail use. A correlation matrix was computed to examine relationships in the holistically measured effectiveness of e-mail writing among categorical

groupings. The three statistical analyses of data are detailed in the following subsections.

### Factor Analysis

Responses to the Attitudes Toward E-mail Technology were subjected to a Principal Component Analysis to determine if the factors from this adapted scale would load similarly to the results found by the originators of the scale (Kinzie & Delcourt, 1991). This analysis was important because the scales had been modified for this study and the population sampled was different. The findings are discussed in Chapter Four.

The same rationale necessitated performing a factor analysis for the various individual items that are used to indicate patterns of e-mail use. Two approaches were taken to distill the multiple items into distinct factors that would facilitate regression analysis. The first strategy was to cluster the e-mail uses into two factors, one for task use and one for social use. The second strategy arrayed the e-mail uses by more specific function: Factor I was "Information Exchange," Factor II was "Collaborative Work," and Factor III was "Diplomacy." The correlations of a number of e-mail uses did not provide justification for a fourth factor but were grouped together as an "Other" category. These other e-mail uses such as "Send assignments

to students," and "Respond to RFPs" were not used in the regression model but were deemed too important in depicting the range of e-mail use to be eliminated from the investigation. These variables were reported in terms of frequency.

### Multiple Regression Analysis

To predict the patterns of e-mail use which is the criterion of behavior, or dependent variable, multiple regression analysis was used. This provided the means for assessing the contribution to e-mail use of each independent variable: attitudes toward e-mail technology, self-efficacy with e-mail technology, and the personal characteristics of age, gender, years in teaching, rank, and years using e-mail. The generic prediction equation for multiple regression analysis can be stated as follows:

$$Y^1 = a + b_1X_1 + b_2X_2 + . . . b_nX_n$$

where

$Y^1$  = criterion to be predicted

$a$  = intercept constant

$b_1$  to  $b_n$  = regression weight for each predictor

$X_1$  to  $X_n$  = independent variables or predictors

variables and the scoring that were included in this model. The model, then was:

$$\text{MAILUSE} = a + b_1X_{\text{attitude}} + b_2X_{\text{efficacy}} + b_3X_{\text{age}} + b_4X_{\text{sex}} + b_5X_{\text{years teach}} + b_6X_{\text{rank}} + b_7X_{\text{years used}}$$

After the model was devised, the following null hypothesis was stated:

$$H_0: b_1 = b_2 = b_3 = b_4 = b_5 = b_6 = b_7 = 0.$$

### Correlation Matrix

In addition to item means and standard deviations, a Pearson's Product Moment correlation matrix was created to examine relationships between holistic scores and readability scores used as dependent variables, and e-mail use, attitudes toward e-mail, and self-efficacy with e-mail technology used as independent variables. The sample subset of individuals that provided e-mail messages for analysis was self-selected, and, as was determined by t-tests, systematically different from the original sample.

### SUMMARY

This chapter described the study design, sample of respondents, instrumentation, survey distribution and data

Table 5

Variables Related to E-mail Use

Variable	Model Designation
<u>Dependent</u>	
General E-mail Use	Y
Task Use	
Information Exchange	
Collaborative Work	
Diplomacy	
Social Use	
<u>Independent</u>	
Attitudes Toward E-mail Technology <sup>a</sup>	X <sub>1</sub>
Usefulness	
Comfort/Anxiety	
Self-Efficacy for E-mail <sup>a</sup>	X <sub>2</sub>
Age <sup>a</sup>	X <sub>3</sub>
Gender	X <sub>4</sub>
Male=1	
Female=2	
Years in Teaching <sup>a</sup>	X <sub>5</sub>
Rank	X <sub>6</sub>
Professor=1	
Associate Professor=2	
Assistant Professor=3	
Instructor=4	
Other=5	
Years Used E-mail	X <sub>7</sub>

<sup>a</sup>These are continuous variables.

collection procedures, and statistical treatment of survey responses. Chapter Four will present the findings.

## Chapter Four

### FINDINGS OF THE STUDY

The purpose of this study was to (a) investigate the functional use of e-mail in a university setting and the relationship of attitudes toward and self-efficacy with e-mail technology and (b) to evaluate writing effectiveness in an electronic medium. The preceding chapter has explained the research design, population sampled, instrumentation, data collection procedures, and statistical analysis. The results of the study are presented in this chapter in two sections. The first section examines selected variables for early and late responses as well as non-respondents. The second section reports the results of the analysis of the data collected to answer the seven research questions detailed in the previous chapter.

#### SURVEY RESPONSE

The survey was sent by campus mail to 500 faculty at Virginia Tech who were randomly selected from a total population of 1,400 faculty with published e-mail addresses. A total of 231 surveys were returned. Four weeks later, the survey was sent again to the 269 individuals who had not responded to the first mailing. A total of 70 surveys were returned by this group, for a total of 301 responses. Of the 301 responses, 262 were usable. Thus, usable responses were received from 52.4% of the sample group. After three

weeks, 199 had still not responded. A summary of response status for the 500 individuals in the sample is given in Table 6.

Ten percent of the non-respondents, or 20 individuals, were interviewed by telephone and asked to respond to 12 key items from the e-mail survey. The researcher chose a few important items from each of the subscales of the survey as well as a number of items dealing with demographic data as key items to represent the entire survey. Sixteen individuals provided responses and four individuals stated they did not use e-mail.

To address the problem of sample representiveness, early and late responses and responses from the 16 non-respondents were separated to determine if any systematic difference existed between the three groups. It is not uncommon that late and non-respondents to surveys tend to differ from prompt respondents on features meaningful to a study (West, 1991). Certain studies have shown that late respondents often resemble non-respondents (Miller & Smith, 1983). In order to support generalizations about the sample based on the respondents, an approach which compares the three groups, or waves, of respondents was employed.

The three waves of responses on the 12 key items were subjected to analysis of variance to test for systematic

Table 6

Responses to Survey

Respondents	N	N	Percent
<b>Usable Responses</b>			
Wave 1	202		
Wave 2 <sup>a</sup>	60	262	52.4
<b>Non-usable Responses</b>			
Wave 1			
Do not use e-mail <sup>b</sup>	17		
Incomplete survey <sup>c</sup>	12	29	5.8
Wave 2			
Do not use e-mail <sup>b</sup>	7		
Incomplete survey <sup>c</sup>	3	10	2.0
Non-Respondents		199	39.8
Total Sample		500	100.0

<sup>a</sup>A second survey was mailed one month later to all non-respondents of the first wave.

<sup>b</sup>These represent faculty who have an e-mail address listed in the campus directory, but do not personally use e-mail. Typically, secretaries or graduate assistants handle e-mail correspondence for them.

<sup>c</sup>Surveys were returned by faculty who indicated unwillingness to participate (n=8), or by a second party who indicated that the addressee was on sabbatical (n=4), no longer employed by the university (n=1), or deceased (n=2).

difference. Table 7 presents the results in summary form. The mean scores for ten of the items were not significantly different at the .05 level. The two items that had a significant difference,  $p > .0215$  and  $p > .0134$ , were subjected to a traditional post-hoc test, Duncan's Comparison Report. This test determined that Item 1, "I have no use for e-mail on a day-to-day basis," was not significantly different for the three groups. The difference in Item 4 was between the non-response group and the first wave only. Therefore, outcomes related to the variable "I feel at ease using e-mail" must be interpreted with some caution when generalizing to the population.

#### Survey Reliability

To ensure the reliability of the three subscales of the e-mail survey, a correlation coefficient was calculated for attitudes toward computer technology, self-efficacy with e-mail technology, and patterns of e-mail use. Cronbach's Alpha was used to calculate the internal consistency of the three subscales. These reliability coefficients, presented in Table 8, ranged from .905 to .917. Cronbach's Alpha was also used to determine the internal consistency of the instrument overall. A reliability coefficient of .965 is indicated for all items of the instrument.

Table 7

Key Items for Early and Late Respondents, and Non-respondents

Survey Question	Response Time						Prob.>F
	Early N=202		Late N=60		Non-Response N=16		
	Mean	SD	Mean	SD	Mean	SD	
1 I have no use for e-mail on a daily basis.	3.82	.57	3.53	1.07	3.85	.36	.0215 <sup>a</sup>
4 I'm at ease using e-mail.	1.54	.88	1.85	1.29	1.07	.27	.0134
9 E-mail technology is confusing to me.	3.18	.98	3.07	1.14	3.71	.61	.1023
16 I feel confident reading messages on e-mail.	1.20	.58	1.28	.73	1.07	.27	.4414
21 I'm confident signing on listserves or discussion groups.	2.71	1.16	2.91	1.39	2.42	1.16	.3607
26 Number of e-mail messages that I send.	3.13	1.26	3.05	1.37	3.00	.88	.8772
28 Number of times I answer someone's e-mail.	2.98	1.18	2.89	1.21	2.93	.92	.8924
30 I use e-mail to send information to people I know.	3.83	1.30	3.53	1.41	3.36	.93	.1778
50 Gender							.0780 <sup>b</sup>
51 Age	3.08	.96	3.38	1.09	2.93	.48	.1055
52 Rank	2.26	1.36	2.01	1.19	1.64	.75	.1259
54 Years in teaching	3.16	1.64	2.96	1.06	3.07	.83	.6933
55 Years using e-mail	3.10	1.22	2.77	1.28	3.21	1.25	.1706

<sup>a</sup>Duncan's Comparison Report determined non-significance.

<sup>b</sup>Chi-square was used to test the significance for gender.

Table 8

Cronbach's Alpha Reliability for Survey and Survey  
Subscales\*

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Subscale	Reliability Coefficient
Attitudes toward E-mail	.917
Self-Efficacy with E-mail	.907
Patterns of E-mail Use	.905
Overall	.965

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\*N = 260

## ANALYSIS OF DATA

Answers to the following research questions were sought with the first series of analysis:

1. How is an individual's attitude toward e-mail technology related to different patterns of e-mail use?
2. How do self-efficacy ratings in e-mail technology relate to different patterns of e-mail use?
3. How does an individual's attitude about e-mail technology relate to self-efficacy?
4. Do relationships exist among demographic characteristics of respondents and different patterns of e-mail use, attitude ratings, and self-efficacy ratings?

The mean, standard deviation, and number of respondents reporting for each e-mail use item was determined. The respondents reported their use on a scale of 1 to 5, from never to often. A "non-applicable" option was provided on the instrument and was treated as missing data. The N reported in subsequent tables reflects items with missing data. Therefore, the N will vary in the various analyses depending on missing data from various items. Table 9 provides a listing of these items ranked in order of most to least used. Seven of the items were

Table 9

Summary Statistics for E-mail Purposes of Use

Variables	N	Mean	SD
<b>Items Retained for Further Analysis<sup>a</sup></b>			
Send information to people I know.	261	3.76 <sup>b</sup>	1.32
Seek information from people I know.	262	3.53	1.38
Keep in touch/maintain relationships.	258	2.87	1.41
Give/receive feedback on reports/ideas.	260	2.81	1.37
Schedule meetings/appointments.	260	2.77	1.29
Distribute/provide information.	261	2.71	1.38
Learn about events that interest me.	258	2.64	1.34
Coordinate activities of a project.	259	2.47	1.32
Monitor progress of projects I work on.	257	2.26	1.35
Send messages from a home computer.	258	2.24	1.89
Brainstorm/generate ideas.	260	2.17	1.21
Organize a social event.	257	1.71	1.13
Broadcast requests for information.	260	1.67	1.14
<b>Items Removed from Further Analysis</b>			
Resend same message to person who missed it the first time.	256	1.78	.94
Resolve conflicts/disagreements.	257	1.56	.87
Poll opinions on a topic.	255	1.55	.89
Take a break from work.	257	1.53	.98
Send/receive messages from students.	240	1.41	.89
Advertise/respond to rfp's.	249	1.36	.78
Participate in games.	256	1.32	.71

<sup>a</sup>Variables with a standard deviation < 1.00 were not retained.

<sup>b</sup>Respondents indicated extent of their e-mail use on a scale of 1 (never) to 5 (often).

virtually unused by the sample faculty or the variance was so limited, less than 1, on an item as to inhibit further analysis. These items were removed from further analysis for the research questions.

### Factor Analysis

Factor analysis was performed on both the attitude items and the patterns of use items of the survey for two purposes: (a) to determine if the factors would load similarly to the factor loadings on the instruments (Kinzie & Delcourt, 1991; Steinfield, 1983) from which the scales were adapted, and (b) to identify a smaller number of factors to facilitate multiple regression and analysis of variance procedures.

The results of a principal component analysis of the 15 attitude items are presented in Table 10. Factor I, which reflected "Usefulness" of e-mail technology, contained nine items which loaded convincingly, .617 to .830, after the factors were rotated. The correlation for item 10, accessing information, was somewhat lower than for the other items, .54. Factor II, which reflected "Comfort/Anxiety" with e-mail technology, contained six items that loaded convincingly after the factors were rotated, .706 to .831. These two factors accounted for 60.2% of the variance for the 15 items in this scale.

Table 10

Principal Component Analysis:  
Varimax Rotation for Attitudes Toward E-mail<sup>a</sup>

Survey Item Number	Stem	Factor <sup>b</sup> 1	Factor <sup>b</sup> 2
<b>Factor I: "Usefulness"</b>			
1	I don't have use for e-mail on a day-to-day basis.	.797 <sup>c</sup>	.169
2	Using e-mail on the job has only meant more work.	.629 <sup>c</sup>	.290
3	I don't think e-mail is useful in my profession.	.659 <sup>c</sup>	.336
5	With e-mail, I can enhance my job performance.	.763	.205
6	If I use e-mail, I will be more productive.	.830	.131
7	Anything that e-mail can be used for, I can do just as well some other way.	.751 <sup>c</sup>	.151
10	I use e-mail to access many types of information for my work.	.540	.425
13	I communicate more often and/or with more people since using e-mail.	.617	.415
15	E-mail is an overrated tool for productivity.	.754 <sup>c</sup>	.126
<b>Factor II: "Comfort/Anxiety"</b>			
4	I feel at ease using e-mail.	.328	.706
8	The thought of using e-mail makes me nervous.	.253	.743 <sup>c</sup>
9	E-mail technology is confusing to me.	.199	.823 <sup>c</sup>
11	I do not feel threatened by the impact of e-mail.	.219	.644
12	I am anxious about e-mail because I don't know what to do if something goes wrong.	.077	.775 <sup>c</sup>
14	I feel comfortable about my ability to work with e-mail.	.252	.831

<sup>a</sup>N=260

<sup>b</sup>These two factors accounted for 60.2% of the variance for the 15 items in this scale.

<sup>c</sup>Scores for negatively phrased stems were recoded before factor analysis was performed.

The results of a principal component analysis of the 20 e-mail use items are presented in Table 11. Factor I, which reflected "Task Use" of e-mail, contained eight items with high loadings, .724 to .848. Factor II, which reflected "Social Use" of e-mail, contained four items, three with significant loadings, .622 to .673. The correlation for Item 49, sending messages from a home computer, was noticeably lower than for the other three items, .414. The two factors accounted for 62.1% of the variance for the twelve items of this scale.

#### Regression Analyses

In order to describe the relationship between attitudes, self-efficacy, e-mail use, and selected demographics, multiple regression analyses were conducted. As discussed previously, the dependent variables, and certain independent variables, consisted of composite scores of the survey items that grouped together as unique factors in the principal component analysis.

The first regression analysis used E-mail Task Use as the dependent variable. Each of the eight items in this factor were assigned scores which ranged from 1 to 5. A score of 1 indicated that an individual never used e-mail for a given purpose, while a score of 5 indicated e-mail was used very often for a given purpose. Total scores for this

Table 11

Principal Component Analysis:  
Varimax Rotation for E-mail Uses<sup>a</sup>

Survey Item Number	Stem	Factor <sup>b</sup> 1	Factor <sup>b</sup> 2
Factor I: "Task Use"			
30	Send information to people I know.	.729	.139
31	Seek information from people I know.	.781	.094
33	Distribute/provide information.	.724	.221
34	Give/receive feedback on reports/ideas.	.848	.156
35	Brainstorm/generate ideas.	.752	.072
36	Monitor progress of projects I work on.	.803	.037
41	Schedule meetings/appointments.	.782	.215
42	Coordinate activities of a project.	.808	.159
Factor II: "Social Use"			
38	Keep in touch/maintain relationships.	.296	.622
39	Learn about events that interest me.	.259	.673
43	Organize a social event.	.282	.629
49	Send messages from a home computer.	.341	.414

<sup>a</sup>N=260

<sup>b</sup>These two factors accounted for 62.1% of the variance for the 12 items of this scale.

construct could, therefore, range from a low of 8 to a high of 40. The regression results are presented in Table 12.

The coefficient of determination, or  $R^2$ , was equal to .4309. The F-ratio of 23.001 was significant beyond the .0001 level. The three variables that resulted in a significant relationship are Years E-mail is Used,  $p > .0049$ ; Attitudes of E-mail Usefulness,  $p > .0000$ ; and Self-efficacy with E-mail Technology,  $p > .0016$ . Usefulness and Self-efficacy have negative correlations because the scale for these is the reverse of the scale for the dependent variable. A score of 1 means highest, while a score of 4 means lowest for these independent variables.

The next regression analysis used E-mail Social Use as the dependent variable. Each of the four items in this factor were assigned scores which ranged from 1 to 5. A score of 1 indicated that an individual never used e-mail for this purpose, while a score of 5 indicated e-mail was used very often for this purpose. Total scores for this construct could, therefore, range from a low of 4 to a high of 20. The results are presented in Table 13.

The coefficient of determination, or  $R^2$ , was .3429. The F-ratio of 15.854 was significant beyond the .0001 level. The four variables that resulted in a significant relationship were Years E-mail is Used,  $p > .0007$ ;

Table 12

Regression Model for Ratings of E-mail Task Use<sup>a</sup>

Source	df	SS	MS	F	P-value
Regression	8	123.708	15.464	23.001	0.0000
Residual	243	163.369	.672		

R Squared = .4309

Variable	b-value	SE B	Beta	T	p-value
Intercept	4.386	.4132			
Years Used	✓ 0.1318	.0465	.1524	2.836	.0049 ✓
Age	-0.0661	.0638	-.0671	-1.037	.3010
Gender	-0.1734	.1362	-.0671	-1.272	.2045
Useful	✓ -0.4742	.0911	-.3267	-5.203	.0000
Years Teaching	-0.0401	.0365	-.0582	1.097	.2738
Rank	-0.0034	.0474	-.0041	-0.071	.9431
Comfort	-0.1130	.1176	-.0795	-0.961	.3375
Efficacy	✓ -0.3572	.1119	-.2723	-3.191	.0016

<sup>a</sup>N = 252

Table 13

Regression Model for Ratings of E-mail Social Use<sup>a</sup>

Source	df	SS	MS	F	P-value
Regression	8	91.285	11.411	15.854	0.0000
Residual	243	174.899	.720		

R Squared = .3429

Variable	b-value	SE B	Beta	T	p-value
Intercept	3.938	.4276			
Years Used	0.1652	.0481	.1984	3.436	.0007 ✓
Age	-0.1796	.0660	-.1736	-2.721	.0070 ✓
Gender	-0.2370	.1410	-.0952	-1.680	.0942
Useful	-0.3388	.0943	-.2424	-3.592	.0004
Years Teaching	0.0623	.0378	.0940	1.648	.1007
Rank	-0.0232	.0491	-.0297	-0.472	.6374
Comfort	-0.0241	.1217	-.0176	-0.198	.8435
Efficacy	-0.2982	.1159	-.2361	-2.575	.0106

<sup>a</sup>N = 252

Age,  $p > .007$ ; Attitudes of E-mail Usefulness,  $p > .0004$ ; and Self-efficacy with E-mail Technology,  $p > .0106$ .

Usefulness and Self-efficacy have negative correlations because the scale for these is the reverse of the scale for the dependent variable.

A regression analysis was also used with Attitudes of E-mail Usefulness as the dependent variable. Each of the nine items in this factor was assigned scores which ranged from 1 to 4. A score of 1 indicated that individuals agreed with the statement about their attitude, while a score of 4 indicated that they disagreed. Total scores for this construct could, therefore, range from a low of 9 to a high of 36. Prior to any factor analysis, responses to negatively-phrased statements were recoded (1=4,2=3,3=2,4=1) so the scale would be consistent. The results are presented in Table 14.

The coefficient of determination, or  $R^2$ , was equal to .4702. The F-ratio of 23.863 was significant beyond the .0001 level. The five variables that resulted in a significant relationship were Rank,  $p > .0291$ ; Attitude of Comfort with E-mail,  $p > .0012$ ; Age,  $p > .0254$ ; E-mail Task Use,  $p > .0001$ ; and Self-efficacy with E-mail Technology  $p > .0299$ . E-mail Task Use has a negative correlation because

Table 14

Regression Model for Ratings of Usefulness of E-mail<sup>a</sup>

Source	df	SS	MS	F	P-value
Regression	9	64.078	7.119	23.863	.0000
Residual	242	72.201	.298		

R Square = .4702

Variable	b-value	SE B	Beta	T	p-value
Intercept	.9439	.3402			
Social	-0.0660	.0454	-.0923	-1.456	.1468
Years Teaching	-0.0017	.0247	-.0036	-.068	.9456
Gender	0.1255	.0910	.0705	1.379	.1693
Rank	0.0687	.0313	.1231	2.196	.0291
Years Used	0.0016	.0318	.0026	.049	.9607
Comfort	0.2511	.0769	.2564	3.268	.0012
Age	0.0971	.0432	.1312	2.249	.0254
Task	-0.1807	.0457	-.2622	-3.953	.0001
Efficacy	0.1652	.0757	.1828	2.184	.0299

<sup>a</sup>N = 252

the scale for this variable is the reverse of the scale for the dependent variable.

A regression analysis was next used with Attitudes of Comfort with E-mail as the dependent variable. Each of the six items in this factor was assigned scores which ranged from 1 to 4. A score of 1 indicated that individuals agreed with the statement about their attitude, while a score of 4 indicated that they disagreed. Total scores for this construct could, therefore, range from a low of 6 to a high of 24. Prior to any factor analysis, responses to negatively-phrased statements were recoded (1=4,2=3,3=2,4=1) so the scale would be consistent. The results are presented in Table 15.

The coefficient of determination, or  $R^2$ , was equal to .6594. The F-ratio of 52.074 was significant beyond the .0001 level. The two variables that resulted in a significant relationship were Attitude of Usefulness of E-mail,  $p > .0012$ ; and Self-efficacy with E-mail Technology,  $p > .0000$ .

The final regression analysis used Self-Efficacy with E-mail Technology as the dependent variable. Each of the ten items in this factor were assigned scores which ranged from 1 to 4. A score of 1 indicated that individuals agreed with the statement about their attitude, while a score of 4

Table 15

Regression Model for Ratings of Comfort with E-mail<sup>a</sup>

Source	df	SS	MS	F	P-value
Regression	9	93.700	10.411	52.074	0.0000
Residual	242	48.382	.199		

R Squared = .6594

Variable	b-value	SE B	Beta	T	p-value
Intercept	0.2146	.2845			
Social	0.0085	.0373	.0117	.229	.8190
Years Teaching	-0.0045	.0202	-.0093	-.224	.8231
Gender	-0.0435	.0748	-.0239	-.581	.5616
Rank	-0.0491	.0257	-.0862	-1.913	.0569
Years Used	0.0234	.0260	.0385	.900	.3690
Useful	0.1683	.0515	.1648	3.268	.0012
Age	0.0193	.0357	.0255	.541	.5892
Efficacy	0.6289	.0477	.6814	13.180	.0000
Task	-0.3722	.0385	-.0529	-.966	.3349

<sup>a</sup>N = 252

indicated that they disagreed. Total scores for this construct could, therefore, range from a low of 10 to a high of 40. The results are presented in Table 16.

The coefficient of determination, or  $R^2$ , was equal to .6936. The F-ratio of 60.855 was significant beyond the .01 level. The four variables that resulted in a significant relationship were Years E-mail was Used,  $p > .0053$ ; Attitude of Usefulness of E-mail,  $p > .0299$ ; Attitude of Comfort with E-mail,  $p > .0000$ ; and Task Use of E-mail  $p > .0232$ . E-mail Task Use and Years Used have negative correlations because the scale for these variables is the reverse of the scale for the dependent variable.

#### Holistic Writing Samples

E-mail messages were rated for communication effectiveness by a panel of experts, with a holistic score ranging from 4 for poor to 20 for excellent given to each message. The messages ranged in length from 50 words to 280 words, and ranged in purpose from an informal note to an acquaintance to a formal request for funding.

The six judges rated a total of 60 messages. The first three judges rated two messages from each of 15 respondents, while the second three judges rated two messages each from the other 15 respondents. A t-test was conducted to determine if the average scores of the first three judges

Table 16

Regression Model for Ratings of Self-Efficacy with E-mail\*

Source	df	SS	MS	F	P-value
Regression	9	115.703	12.866	60.855	0.0000
Residual	242	51.123	.211		

R Squared = .6936

Variable	b-value	SE B	Beta	T	p-value
Intercept	1.5309	.2736			
Social	-0.0505	.0382	-.0638	-1.323	.1872
Years Teaching	0.0028	.0208	.0053	.134	.8933
Gender	-0.1304	.0764	-.0662	-1.706	.0892
Rank	-0.0334	.0265	.0541	1.261	.2086
Years Used	0.0741	.0263	-.1125	-2.812	.0053
Comfort	0.6645	.05041	.6132	13.180	.0000
Age	-0.0079	.0367	-.0097	-.217	.8286
Useful	0.1169	.0536	.1057	2.184	.0299
Task	-0.0897	.0392	-.1176	-2.285	.0232

\*N = 252

differed from the average scores of the second three judges. The t-value was 1.73 with a probability of .1987. Since the scores from both sets of judges were not significantly different, further analysis of messages was done as one subset.

In addition, a readability score for each of the messages was generated by the computer software program Grammatik. The lower the score, on a scale of 0 to 100, the more difficult the writing is to read. The scores for the 60 messages ranged from 30 to 89. The mean was 62.93, while the standard deviation was 17.25.

Since the sample subset that provided copies of e-mail messages was self-selected, it was deemed necessary to determine if the subset differed systematically from the total sample before any subset analysis could be conducted. As the results of two sample t-tests, summarized in Table 17, indicate, the two groups differ significantly on the three independent variables under consideration. The mean for the e-mail use variable is greater for the subset, indicating more frequent e-mail use. The means for the attitude and self-efficacy variables are lower for the subset, indicating more positive attitudes and greater self-efficacy.

The two groups being different, the relationship, if any, that existed between the holistic writing scores,

Table 17

Results of T-Tests for Independent Variables for Total Sample and Writing Sample Subset

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Variable	Total Sample N=232		Subset N=30		t-value	Prob.>t
	Mean	SD	Mean	SD		
E-mail Use	30.75	11.18	37.23	7.32	3.09	.0020
Efficacy	2.08	.78	1.56	.66	-3.45	.0006
Attitude	1.78	.72	1.31	.29	-3.56	.0004

---

readability scores, and the independent variables, was examined through correlation procedures. As shown in Table 18, correlations between the dependent variable of holistic and readability scores and the independent variables is virtually non-existent. The correlation for the independent variables with holistic scores ranges from .03 for attitudes toward e-mail to .07 for e-mail use. The correlations for the independent variables with readability scores ranges from .01 for e-mail use to .07 for attitudes toward e-mail. The correlation between the two dependent variables, holistic scores and readability scores is  $-.41$ , a low negative correlation (Hinkle, Wiersma, & Jurs, 1979). The correlation is expressed negatively because the scale for holistic effectiveness is the reverse (low to high) of the readability scale (high to low). Thus, the higher holistic ratings tended to be messages with ratings of greater reading difficulty.

#### SUMMARY

A total of 262 respondents provided usable data for statistical treatment. Sample representiveness was established by analysis of variance of early and late respondents, and non-respondents. Caution is advised on interpreting outcomes from the sample to the population as

Table 18

Pearson Correlations Between Holistic Ratings, Readability Scores, Attitudes Toward E-mail, Self-efficacy with E-mail, and E-mail Use\*

Variables	Mean	S.D.	Holistic r value	Readability r value
E-mail use	37.23	7.32	0.07	0.02
Efficacy with E-mail	1.56	0.66	0.05	0.03
Attitudes toward E-mail	1.31	0.29	0.03	0.07
Holistic Scores	16.18	0.51	1.00	-0.41
Readability Scores	62.93	17.25	-0.41	1.00

\*N = 30

one survey item on which the non-response group differed significantly from the response group surfaced. Survey reliability was substantial,  $r = .905$  to  $r = .917$ , even though modifications were made when adapting the original instruments.

Factor analysis determined that (a) the attitude toward e-mail items clustered into two constructs similar to the Kinzie and Delcourt (1991) instrument, and (b) the e-mail use items clustered into two constructs similar to the Steinfield (1983) instrument. Thirteen of the twenty e-mail use items were used moderately to very often.

Multiple regression analysis indicated that (a) attitudes of usefulness of e-mail and self-efficacy with e-mail technology were significant in predicting e-mail use; (b) comfort with e-mail was significant in predicting self-efficacy; (c) a person's age was significant in predicting social use of e-mail and usefulness of e-mail; (d) faculty rank was significant in predicting e-mail usefulness, professors ranking usefulness higher than associate professors, assistant professors, and instructors; and (e) years e-mail was used was significant in predicting both task and social e-mail use as well as self-efficacy.

A correlation matrix indicated that neither attitudes, self-efficacy, nor extent of e-mail use was related to effective writing of e-mail messages.

## Chapter Five

### SUMMARY, DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

#### SUMMARY

This study was designed to investigate faculty communication in an electronic environment. This chapter provides a summary of the study, with the statement of the problem, procedures, findings, discussion, conclusions, and recommendations presented in sections.

#### Statement of the Problem

The purpose of this study was (a) to examine the functional use of e-mail in a university setting and the relationship of e-mail use with attitudes toward and self-efficacy with e-mail technology, and (b) to evaluate writing effectiveness in an electronic medium. The study also attempted to determine if certain personal characteristics could serve as predictor variables for explaining e-mail use, attitudes toward e-mail, and self-efficacy with e-mail technology.

#### The Sample

The population of interest was the teaching faculty at Virginia Polytechnic Institute and State University who have published e-mail addresses. From a total population of 1,400, a random sample of 500 faculty were sent a survey via campus mail. In addition to providing responses regarding

e-mail use, attitudes toward e-mail, perceived self-efficacy with e-mail technology, and demographic data, those surveyed were asked if they would be willing to provide sample e-mail messages that they had written. The sample messages served as the data source for document analysis.

### Instrumentation

The survey instrument consisted of four major sections which served to measure variables of interest. Independent variables chosen for the study included: (a) attitudes toward e-mail technology, (b) self-efficacy with e-mail technology, and (c) demographic characteristics such as age, gender, number of years in teaching, rank, and number of years e-mail has been used. The dependent variables were categorized according to essential function of use, namely task use or social use.

Holistic effectiveness ratings of e-mail communication also served as a dependent variable. The document analysis portion of the study employed two measurements: (a) a panel of six experts used a holistic rating scale to determine an effectiveness score for each document, and (b) the software computer program Grammatik 5 was used to determine a readability score for each document.

To measure attitudes toward e-mail, a modified version of an instrument developed by Kinzie and Delcourt (1991) was prepared. Respondents were asked to agree or disagree with

15 items concerning their attitudes of comfort and anxiety with using e-mail as well as their attitudes toward e-mail's usefulness.

The second part of the survey instrument dealt with respondents perceived self-efficacy with e-mail technology. A scale similar to the one designed by Kinzie and Delcourt (1991) was used to measure self-efficacy with particular e-mail features. Respondents were asked to agree or disagree with 10 items involving basic to advanced uses of e-mail.

The third part of the survey instrument pertained to various uses of e-mail. An instrument developed by Steinfield (1983) was adapted to measure the extent to which faculty use e-mail for 20 specific purposes. Two additional items were included in this part of the survey. One item asked about sending assignments to students and the other asked about sending e-mail messages from a home computer.

The final part of the instrument pertained to biographical information. Data concerning gender, age, rank, years in teaching, years using e-mail, manner in which e-mail was learned, whether one would attend a class or workshop on e-mail, and the e-mail program predominately used were included in part four.

## Data Collection

Survey instruments were sent via campus mail to the sample of 500 faculty. A follow-up survey was sent four weeks after the initial mailing to encourage further responses. A total of 301 surveys were returned, yielding an overall response rate of 60.2%. From this number, 262 were considered usable, giving an overall usable response rate of 52.4%. Initially, 43 respondents indicated they would send copies of e-mail messages for document analysis. A total of 33 individuals actually sent copies of messages. The messages of 30 individuals were long enough to be considered usable. The e-mail messages were sent electronically by the respondents to the researcher.

## Findings

The research questions serve as a framework for reviewing the findings of the study with the first section addressing the first four questions.

1. How is an individual's attitude toward e-mail technology related to different patterns of e-mail use?
2. How do self-efficacy ratings in e-mail technology relate to different patterns of e-mail use?
3. How does an individual's attitude about e-mail technology relate to self-efficacy?
4. Do relationships exist among demographic characteristics of respondents and different patterns

of e-mail use, attitude ratings, and self-efficacy ratings?

Factor analysis was performed on both the attitude items and the patterns of use items of the survey for two purposes: (a) to determine if the factors would load similarly to the factor loadings on the instruments from which the scales were adapted, and (b) to identify a smaller number of factors to facilitate multiple regression procedures.

Attitude toward e-mail items clustered into two factors, "Usefulness" which encompassed nine of the attitude items, and "Comfort/Anxiety" which encompassed six of the attitude items. E-mail use items clustered into two factors, "Task Use" which encompassed eight items, and "Social Use" which encompassed four items.

Using multiple regression, the relationships (a) among attitudes, use, and demographics; (b) among self-efficacy, use, and demographics; and, (c) among attitudes, self-efficacy, and demographics were established. Below is a summary of the variables with significant contributions in the various models. The coefficient of determination, or  $R^2$ , in each of the five regression models was substantial. In the Ratings of E-mail Task Use model, the  $R^2$  was .43; in the Ratings of E-mail Social Use model, the  $R^2$  was .34; in

the Ratings of Usefulness of E-mail model, the  $R^2$  was .47; in the Rating of Comfort with E-mail model, the  $R^2$  was .66; and in the Rating of Self-efficacy with E-mail model, the  $R^2$  was .69.

Years E-mail Has Been Used. The regression analyses for both task use and social use of e-mail revealed that the number of years an individual has used e-mail contributed significantly to prediction of how often an individual uses the technology for both tasks. It was also a significant predictor in the self-efficacy model. The level of significance for this variable in the task use regression was .0049, with a b-value of .1318. The level of significance for it in the social use regression was .0007, with a b-value of .1652; and for the self-efficacy regression, the significance level was .0053, with a b-value of -.0741. The number of years an individual has used e-mail did not, however, contribute significantly to information in the prediction of attitude toward e-mail technology.

Age. The regression analyses for social use of e-mail and for usefulness of e-mail revealed that age contributed significantly to information in the prediction of social use and a positive attitude of usefulness. Younger people use e-mail more than older for social purposes and have more

positive usefulness attitudes than do older people. The level of significance for this variable in the social use model was .007, with a b-value of  $-.1796$ . The level of significance for this variable in the usefulness model was .0254, with a b-value of  $.0971$ . Age was not a significant factor in the analyses for task use, attitude of comfort, or self-efficacy with e-mail technology.

Rank. The regression analysis for usefulness of e-mail revealed that rank did contribute significant information in the prediction of attitudes of usefulness. Higher ranking faculty found e-mail more useful. The level of significance for this variable was .0291, with a b-value of  $.0687$ . Rank was not significant in any of the other regression models.

Comfort with E-mail. The regression analyses for the usefulness of e-mail and for self-efficacy with e-mail technology revealed that comfort contributed significant information in the prediction equation. The level of significance for this variable in the usefulness model was .0012, with a b-value of  $.2511$ ; while the significance for it in the self-efficacy model was .0000, with a b-value of  $.6645$ . Comfort with e-mail was not significant in any of the other regression models.

Usefulness of E-mail. All of the regression analyses for which usefulness of e-mail was included as an independent variable revealed that it contributed

significant information for the prediction of the dependent variable. The level of significance for this variable in the task use model was .0000, with a b-value of  $-.4742$ . The level of significance for it in the social use model was .0004, with a b-value of  $-.3388$ ; while the level of significance for it in the comfort with e-mail model was .0012, with a b-value of  $.1683$ . Further, the level of significance of it in the self-efficacy model was .0299, with a b-value of  $.1169$ .

Self-efficacy with E-mail Technology. All of the regression analyses for which self-efficacy with e-mail was used as an independent variable revealed that it contributed significant information for the prediction of the dependent variable. The level of significance for this variable in the task use model was .0016, with a b-value of  $-.3572$ . The level of significance for it in the social use model was .0106, with a b-value of  $-.2982$ ; while the level of significance for it in the comfort with e-mail model was .0000, with a b-value of  $.6289$ . Finally, the level of significance of it in the usefulness model was .0299, with a b-value of  $.1652$ .

Neither a person's sex nor years in teaching was a significant factor in any of the regression analyses.

The second section of the findings addresses the fifth, sixth, and seventh research questions. They follow:

5. How does the holistically rated quality of an individual's e-mail writing samples relate to patterns of e-mail use?
6. How is an individual's attitude toward e-mail technology related to holistic quality ratings of an individual's e-mail writing samples?
7. How do self-efficacy ratings relate to holistic quality ratings of an individual's e-mail writing samples?

The data used to address these questions were limited to that supplied by the subset of the sample that elected to provide e-mail messages for analysis. Two messages from each of 30 participants were rated for communication effectiveness by a panel of experts. A readability score was also generated through use of the software program Grammatik 5.

Independent t-tests were conducted to determine that the sample subset differed systematically on the three independent variables, (a) attitudes toward e-mail, (b) self-efficacy with e-mail technology, and (c) e-mail use. The self-selected subset had more positive attitudes, greater self-efficacy, and used e-mail more often than the rest of the sample.

To examine the relationship between holistic writing scores, readability scores, and the independent variables for the self-selected sample, a correlation matrix was

generated. The results indicate that correlation between dependent and independent variables is virtually non-existent. The correlation of independent variables with holistic scores ranges from .03 for attitudes toward e-mail to .07 for e-mail use. The correlation of independent variables with readability scores ranges from .01 for e-mail use to .07 for attitudes toward e-mail. The correlation between the two dependent variables, holistic scores and readability scores is  $-.41$ , a low negative correlation. The correlation is expressed negatively because the scale for holistic effectiveness is the reverse (low to high) of the readability scale (high to low).

The messages ranged in length from 50 words to 280 words. The content of the messages varied considerably, ranging from an informal note to an acquaintance, to a formal request for funding. Considerable variance existed in both the holistic scores assigned by the expert panel and the readability scores generated by the grammar checker program. Messages with higher effectiveness scores tended to have more difficult reading level scores.

#### DISCUSSION

Although the overall response rate for the survey was only a moderate 60.2% and the useable response rate was only 52.4%, two arguments can be made in favor of sample representativeness. First, information from the Office of

Research and Measurement at Virginia Tech indicates that the history of survey response among faculty at the institution ranges from 40% to 60%. More surveys come across the desks of those employed at a research institution than at other work environments and many individuals chose not to participate in so many surveys. Almost all of the 20 non-respondents contacted by telephone explained that both a busy schedule and an abundance of surveys over the years made them reluctant to participate in this survey.

Second, results of tests for analysis of variance among the early and late respondents and non-respondents indicate virtually no systematic differences among the three waves of response. Only one item, "I feel at ease using E-mail," proved to be significantly different between the non-respondent and early respondent groups. Therefore, caution is advised for the interpretation of outcomes related to this variable. No difference was found between early and late respondents; therefore, the data from both groups were treated as one sample for subsequent statistical treatment.

Discussion about this study pivots around the ways that people use e-mail. Two ideas stand out when the results of this aspect of the study are compared to the results of the Steinfield (1983) study that investigated the same dependent variable. First, summary statistics for the purposes of e-mail use indicate that for most specific purposes little has

changed since 1983. Despite the difference in setting from a commercial corporation to a non-profit educational institution, individuals are using e-mail for most of the same functions.

Two e-mail purposes that were not indicated as used in this study that were indicated in the earlier study are "taking a break from work" and "participating in games." Three possible explanations are offered for this difference. Either individuals in higher education are less apt to take time for "frivolous" activity than individuals in a business setting or perhaps they are less inclined to admit it. Also, a similar study conducted in the same business setting today might show that individuals are more pressured to stay on task due to increased competition and the downsizing of the workforce in recent years.

Second, when the results of the factor analysis were examined, it was evident that loadings were similar to the loadings on the instruments from the Steinfield (1983) study. Of the twenty e-mail use items, two factors show significant loadings: task use and social use. An argument can therefore be made in favor of viewing these uses as two distinct activities.

Factor analysis was also performed on the attitude scale which was adapted from the Kinsey and Delcourt (1991) instrument. This analysis was performed to determine if

factors would load in a similar fashion to the factor loadings on the original scales and to identify a smaller number of factors to facilitate multiple regression analysis. The results of a principal component analysis of the fifteen attitude items resulted in a two-factor model. Factor one, which reflected usefulness of e-mail technology, contained nine items. Factor two, comfort/anxiety with e-mail technology, contained six items. The original Kinsey and Delcourt (1991) instrument phrased the attitude items as "attitude toward computer technology," while the present study phrased the questions "attitudes toward e-mail technology." The results of this analysis provide evidence of construct validity and support findings of attitude toward computer technology research.

#### CONCLUSIONS

The purpose of this study was to explore relationships between patterns of e-mail use, attitudes toward e-mail, self-efficacy with e-mail technology, and certain personal characteristics of e-mail users. Regression analyses were used to identify certain predictors of task and social use of e-mail. Also, relationships of e-mail use, attitudes, and self-efficacy with scores of holistically rated e-mail messages were examined. Correlations provided outcomes needed to relate these variables to the holistic scores.

## Conclusions Related to Research Questions 1 Through 4

The findings of the analyses used to answer the first four research questions, which were concerned with e-mail use, attitudes, self-efficacy, and personal characteristics, for the most part were in agreement with findings of prior research. The five conclusions that follow are based on the findings for the first four research questions.

1. A positive attitude toward e-mail's usefulness relates to the extent of university faculty task and social use of e-mail. Therefore, to encourage faculty use of e-mail, effort must be given to developing positive attitudes toward the usefulness of it. This conclusion is in agreement with findings reported by Igarria and Chakrabarti (1990) and Kinzie and Delcourt (1991) who found this attitude to be a significant predictor variable. Also, perceived utility had the strongest relationship with task use in the Steinfield (1983) study which is logical considering the utilitarian nature of the task purposes. An attitude of comfort with e-mail technology, however, was not related to e-mail use. The lack of correlation between comfort and use underscores the importance of the usefulness attitude. Individuals use e-mail whether or not they feel comfortable with the technology because they feel it is useful.

2. Faculty perceptions of their self-efficacy with e-mail were related to the extent they used the technology: the more confident the faculty member is with e-mail, the more likely the faculty member is to use it. Therefore, if faculty are to use e-mail, they must be provided opportunities to develop confidence in their use of it. Self-efficacy was a significant variable in relation to all dependent variables in the various regression models. Self-efficacy's importance in the findings of this study reflects the findings of Kinzie and Delcourt (1991) who reported strong relationships between self-efficacy and use of e-mail and comfort with computer technology.

3. Faculty age is related to social use of e-mail, with younger faculty being more inclined to use it for this purpose. Thus, in encouraging younger faculty to become involved in e-mail use, the advantages of social networking should be emphasized. This finding agrees with the findings of Steinfield's (1983) study which reported that younger employees were more likely to use e-mail for social purpose but that age does not relate to task use. Steinfield (1983) suggested a conceptualization of e-mail as a potentially helpful way for becoming part of the social networks of an organization. Younger faculty at a university may find it advantageous to use e-mail for the same purpose of integrating into existing social networks.

4. Years e-mail has been used was a strong predictor variable in relation to faculty use of e-mail, with more years equating to a greater likelihood to use e-mail. Thus, getting faculty to use e-mail may depend on their being provided opportunities to gain experience with it over time. This outcome concurs with much of the prior research (Steinfeld, 1983; Igarria & Chakrabarti, 1990; Kinzie & Delcourt, 1991). The finding that experience did not predict attitudes of usefulness or comfort concur with similar findings of Kinzie and Delcourt (1991). One might expect experience to increase the level of comfort. An unfriendly user interface may explain why individuals use e-mail for their work and continue to feel anxious about it.

5. Rank was related to more positive attitudes toward e-mail's usefulness, with higher ranking faculty rating this variable more positively than lower ranking faculty. Thus, it appears that faculty seeking higher rank can benefit from developing skills and knowledge needed to use e-mail effectively. The added responsibility that accompanies higher rank may necessitate the increased use of productivity tools such as e-mail. Also, higher ranking faculty are more involved in administrative functions for which e-mail is especially useful and for which most other administrators are using e-mail.

### Conclusions Related to Research Questions 5 Through 7

The findings of the analyses used to answer the fifth, sixth, and seventh research questions, which were concerned with the relationship of holistic ratings of e-mail messages and e-mail use, attitudes, and self-efficacy are offered as preliminary conclusions. They are based on responses from a sample of self-selected faculty who differed systematically from the rest of the sample group on all of the independent variables. Thus, the generalizability of any findings would be quite limited.

The results indicate that correlations between the dependent variable of holistic writing scores and the independent variables of attitudes toward e-mail, self-efficacy with e-mail, and e-mail use are virtually non-existent. Thus, it most likely would not be helpful for teachers to know levels of student attitudes or self-efficacy for teaching various aspects of writing e-mail messages. A low negative correlation,  $-.41$ , was found between the holistic writing scores and the readability scores of the messages, with the more difficult to read messages receiving the higher holistic scores. Therefore, teachers may want to alert students that e-mail messages written at a too simplistic level may not be perceived as favorably by recipients as ones more carefully worded, especially in a professional environment.

## RECOMMENDATIONS

The findings and conclusions of this study indicate that certain variables such as attitudes, self-efficacy, experience, age, and rank relate to variance in levels of task and social use of e-mail. Further, attitudes, self-efficacy, and levels of use do not relate to holistic ratings of writing effectiveness. These conclusions are used to support the following recommendations for instruction and for further research.

### Recommendations for Instruction

The many practical uses of e-mail, from speedy delivery of information, to administrative functions, to collaborative work sharing, need to be emphasized to students in order to increase their motivation to work in an electronic environment. Since findings of the study suggest usefulness is the most significant of the attitude variables, teachers should consider giving assignments that rely on e-mail's practicality for successful completion.

Self-efficacy with e-mail technology may seem to be an after-the-fact variable as it relates to attitudes and extent of use. That is, one might think that individuals are only confident with the technology after they have successful experience. However, self-efficacy is more a feeling of confidence of potential success with an unfamiliar task. This more specific definition of self-

efficacy emerged from the literature review and the findings of this study. Therefore, if self-efficacy is more task specific than a general feeling of self-assurance, the findings suggest that confidence must be built before instruction in e-mail communication begins. Experience with other computer software such as word processing programs, and experience with a variety of communication formats such as memo writing, report writing, and collaborative writing would help provide a solid foundation for self-efficacy with e-mail technology.

If experience with e-mail is important, then instruction should involve as much hands-on application as possible. Conceptually, e-mail is fairly rudimentary; the difficulties are presented by the unfamiliar communication conventions and the often less-than-friendly user interface. Successful experience is the best way to overcome these difficulties. Another recommendation in this area would be to have teachers provide an e-mail address to students and to encourage students to communicate with them over this medium.

In the present study, gender was not a significant factor as it was in many prior studies where females had higher levels of anxiety about computers. Two explanations are offered for this favorable result. First, in a university setting, one would not expect to find gender

differences relating to work being done by faculty. Second, as computers have become more commonplace at work, women have begun to have as much experience with computer technology as men. For teachers, this encouraging finding should serve as a reminder against bias of any kind.

The wide range of holistic scores for communication effectiveness suggests that some individuals are more careful than others when composing e-mail messages. Instruction in e-mail communication should rely on the same fundamentals for good writing as any communication course in the curriculum. The fact that an e-mail message sent to a distribution list may be read by thousands of people should serve as added motivation for careful writing. The range of grade level for readability scores suggests that instruction in e-mail communication should recognize the range of formality appropriate for various written formats. For example, the minutes of an organization's annual meeting would be written at a higher level than an informal memo to a colleague. Along with an emphasis on modeling writing as it is done in the real world, by practicing professionals, instruction should not neglect the basics of good writing.

#### Recommendations for Further Research

1. To confirm the findings of this study, this research should be replicated in other similar settings where an e-mail system has been in place for many years and

where faculty are fairly experienced users of e-mail. Longitudinal research that tracks the use of e-mail and the other variables over time is also recommended.

2. The study should also be duplicated using high school teachers or community college teachers as the sample frame. College faculty have easier access to internal and external networks, and the nature of their work, especially in a research intensive institution, would make their e-mail use more commonplace, and less typical of the teaching profession.

3. This study should be conducted with a larger group of people providing e-mail messages for analysis. A random selection of messages could then be used for analysis rather than the self-selected messages used in this study.

4. Research that employs other methods to determine purposes of e-mail use should be conducted among a variety of populations. A content analysis of e-mail messages that codes for purpose of use could improve the validity of classifying e-mail uses.

5. Research should be conducted from the standpoint of the receiver of e-mail. Whereas this study examined senders of e-mail, perceptions of those reading the messages would contribute to the understanding of another facet of the communication dynamic.

6. A qualitative research study should be conducted to investigate why a person uses or does not use e-mail. Examining the practices of highly experienced users would increase the richness of information. Interviews would uncover more in depth how "power-users" approach e-mail and their attitudes toward it.

7. The various recommendations for further research would be not only pertinent for teachers, but also individuals in various types of industry, and individuals at various administrative levels.

## References

- Alexander, E. R., Helms, M. M., & Curran, K. E. (1987). An information processing of organization information adequacy/abundance. Management Communication Quarterly, 1, 150-172.
- Bangert-Drowns, R. L. (1993). The word processor as an instructional tool: A meta-analysis of word processing in writing instruction. Review of Educational Research, 63(1), 69-93.
- Bandura, A., Adams, N. E., & Beyer, J. C. (1977). Cognitive processes mediating behavioral change. Journal of Personality and Social Psychology, 35, 125-139.
- Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, 122-147.
- Byrd, D. B., & Koohang, A. A. (1989). A professional development question: Is computer experience associated with subjects' attitudes toward the perceived usefulness of computers? Journal of Research on Computing in Education, 21, 401-410.
- Bretz, R. (1971). A taxonomy of communication media. Englewood Cliffs, NJ: Educational Technology Publications.
- Carroll, J. (1992). E-Mail network expands quickly across the globe. Computing Canada, 18(10), 57.
- Clement, F. J. (1981). Affective consideration in computer-based education. Educational Technology, 1, 28-32.
- Collier, R. (1983). The effects of a computer-based text editor on the creativity and writing skills of community college writing students: A pilot study. Alberta, Canada. (ERIC Document Reproduction Service No. ED 246 430)
- Compton, D. C., White, K., & DeWine, S. (1991). Techno-sense: Making sense of computer-mediated communication systems. The Journal of Business Communication, 28(1), 23-43.

- Costanzo, W. V. (1989). The electronic text. Englewood Cliffs, NJ: Educational Technology Publications.
- Dambrot, F. H., Watkins-Malek, M. A., Silling, S. M., Marshall, R. S., & Garver, J. A. (1985). Correlates of sex differences in attitudes toward and involvement with computers. Journal of Vocational Behavior, 27, 71-86.
- Etchison, C. (1985). A comparative study of the quality of syntax of compositions by first year college students using handwriting and word processing. Glenville, WV: Glenville State College. (ERIC Document Reproduction Service No. 282 215)
- Flatley, M. E. (1992). E-mail: Vital technology to today's businesses. Business Education Forum, 47(2), 21-23.
- Francis, L. J. (1993). Measuring attitude toward computers among undergraduate college students: The affective domain. Computers and Education 20(3), 251-155.
- Goodin, E. H., & Swerdlow, S. (1987). The current quality of written correspondence: A statistical analysis of the performance of 13 industry and organizational categories. Bulletin of the Association for Business Communications. 50(1), 12-16.
- Goodman, S. E. (1992). Political activity and international computer networks. Communications of the ACM, 35(2), 174.
- Grammatik 5 User's Guide. (1992). San Francisco: Reference Software International.
- Handler, M. G. (1993). Preparing new teachers to use computer technology: Perceptions and suggestions for teacher educators. Computers and Education, 20(2), 147-156.
- Hartley, J. (1987). Designing electronic text: The role of print-based research. Educational Communication and Technology Journal, 35(1), 3-17.
- Hawkins, D. T. (1990). Information delivery - paper and mail. Online, 14(2), 100-103.

- Hesse, B. W. & Grantham, C. E. (1991). Electronically distributed work communities: Implications for research on telework. Electronic Networking, 1(1), 4-17.
- Hesse, B. W., Sproull, L. S., Kiesler, S. B., & Walsh, J. P. (1993). Returns to science: computer networks in oceanography. Communications of the ACM, 36(8) 90-101.
- Hesse, B. W., Werner, C. M., & Altman, I. (1988). Temporal qualities of computer-mediated communication. Computers in Human Behavior, 4, 1-19.
- Hignite, M. A., & Echternacht, L. J. (1992). Assessment of the relationship between computer attitudes and computer literacy levels of prospective educators. Journal of Research on Computing in Education, 24, 381-391.
- Hinkle, D. E., Wiersma, W., & Jurs, S. G. (1979). Applied statistics for the behavioral sciences. Chicago: Rand McNally College Publishing Company.
- Holden, M. & Mitchell, W. (1993). The future of computer-mediated communication in higher education. EDUCOM Review, 28(2), 31-37.
- Igbaria, M. & Chakrabarti, A. (1990). Computer anxiety and attitudes towards microcomputer use. Behavior & Information Technology, 9(3), 229-241.
- Itzkan, S. J. (1992). How big is the global classroom? Matrix News, 2(10), 1, 7-8.
- Kalaja, P., & Leppanen, S. (1991). Transaction and interaction in writing: The case of electronic mail. ED 341 293
- Kiesler, S., Siegel, J., & McGuire, T. W. (1984). Social psychological aspects of computer-mediated communication. American Psychologist, 39(10), 1123-1134.
- Kinzie, M. B., & Delcourt, M. A. B. (1991). Computer Technologies in teacher education: The measurement of attitudes and self-efficacy. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL. (ERIC Document Reproduction Service No. ED 331 891)

- Kinzie, M. B., Delcourt, M. A. B., & Powers, S. M. (1993). Computer technologies: Attitudes and self-efficacy. Paper presented at the 1993 annual meeting of the American Educational Research Association, Atlanta, GA.
- Komsky, S. H. (1991). A profile of users of electronic mail in a university: Frequent versus occasional users. Management Communication Quarterly, 4, 310-340.
- Koohang, A. A. (1989). A study of attitudes toward computers: Anxiety, confidence, liking, and perception of usefulness. Journal of Research on Computing in Education, 22, 137-150.
- LaLomia, M. J., & Sidowski, J. B. (1993). Measurements of computer anxiety: A review. International Journal of Human-Computer Interaction, 5, 239-266.
- Leslie, J. (1994). Mail bonding. Wired, 2(3). 42-48.
- Likert, R. (1932). A technique for the measurement of attitudes. Archives of Psychology, 140, 1-55.
- Loyd, B. H. & Gressard, C. (1984). Reliability and factorial validity of computer attitude scales. Educational and Psychological Measurement, 44, 501-505.
- Loyd, B. H. & Gressard, C. (1984). The effects of sex, age, and computer experience on computer attitudes. AEDS Journal, 18(2) 67-77.
- Mathews, W. M., & Wolf, A. W. (1983, April). Measuring attitude toward computers; The computer appreciator-critic attitude scales. Paper presented at the meeting of the American Research Association, Quebec, Canada.
- McCusker, T. (1993). The database way to integrate e-mail. Datamation, 39(2), 61-62.
- Miller, L. E., & Smith, K. L. (1983). Handling nonresponse issues. Journal of Extension, 21, 45-50.
- Mitchell, B., Crawford, M. C., & Madden, R. B. (1985). An investigation of the impact of electronic communication system on organizational communication patterns. The Journal of Business Communication, 22(4), 9-16.

- Miura, I. T. (1986). Computer self-efficacy: A factor in understanding gender differences in computer course enrollment. Paper presented at the annual meeting of the American Educational Research Association, 1986, San Francisco, CA. (ERIC Document Reproduction Service No. ED 271 104)
- Nunamaker, J. F., Dennis, A. R., Valacich, J. S., Vogel, D. R., & George, J. F. (1991). Electronic meeting systems to support group work. Communications of the ACM, 34(7), 40-61.
- Quellmalz, E. (1982). Scale for evaluating expository writing. Center for Study of Evaluation, UCLA, CA. (ERIC Document Reproduction Service No. ED 236 670)
- Pearce, C. G., & Barker, R. T. (1991). A comparison of business communication quality between computer written and handwritten samples. The Journal of Business Communication, 28(2), 141-151.
- Press, L. (1993). Technetronic education: Answers on the cultural horizon. Communications of the ACM, 36(5), 17-22.
- Rapaport, M. (1991). Computer mediated communications. New York: John Wiley & Sons, Inc.
- Roberts, N., Blakeslee, G., Brown, M., & Lenk, C. (1990). Integrating telecommunications into education. Englewood Cliffs, NJ: Prentice Hall.
- Ruberg, L. (1992). A review of instructional uses of e-mail in classroom teaching: Implications for teacher training and educational practice. Paper presented at the Eastern Educational Research Association Conference.
- Schaefermeyer, M. J. & Sewell, H. E. (1988). Communicating by electronic mail. American Behavioral Scientist, 32,(2), 112-123.
- Schunk, D. H. (1985). Self-efficacy and classroom learning. Psychology in the Schools, 22, 208-223.

- Scovell, P. (1991). Differences between computer and non-computer-mediated communication: Preliminary experimental study. Paper presented at the annual meeting of the Eastern Communication Association, Pittsburgh, PA. (ERIC Document Reproduction Services No. ED 333 520).
- Seabrook, J. (1993). E-mail from Bill. The New Yorker, 69(45), 48-61.
- Sherblom, J. (1988). Direction, function, and signature in electronic mail. The Journal of Business Communication, 25(4), 39-54.
- Sproull, L., & Keisler, S. (1991). Connections: New ways of working in the networked organization. Cambridge, MA: MIT Press.
- Stein, J., & Yates, J. (1983). Electronic mail: How will it change office communication? How can managers use it effectively? In R. W. Beswick & A. B. Williams (Eds.). Information systems and business communication. (pp 103-106). Urbana, IL: University of Illinois, Association for Business Communication. (ERIC Document Reproduction Services No. ED 274 006).
- Steinfeld, C. W. (1983). Communications via electronic mail: Patterns and predictors of use in organizations. University of Southern California. Doctoral Dissertation.
- Torkzadeh, G., & Angulo, I. E. (1992). The concept and correlates of computer anxiety. Behaviour and Information Technology, 11(2), 99-108.
- Torkzadeh, G., & Koufteros, X. (1993). Computer user training and attitudes: A study of business undergraduates. Behaviour and Information Technology, 12(5), 284-292.
- West, L. J. (1991). A frequently violated requirement in survey research. Journal of Education for Business, 66(3), 134-135.
- Wild, R. H., & Winniford, M. (1993). Remote collaboration among students using electronic mail. Computers and Education, 21(3), 193-203.

Witte, S. P., & Faigley, L. (1981). Coherence, Cohesion, and writing quality. College Composition and Communication, 32, 189-204.

Wunsch, D. R. (1986). Survey research: Determining sample size and representative response. Business Education Forum, 40(5), 31-34.

APPENDIX A  
SURVEY INSTRUMENT ITEMS

This section of the survey has statements about e-mail technology. After reading each statement, please indicate the extent to which you agree or disagree, by marking your responses in the answer column. Respond to questions 1 - 25 according to the following scale:

1) Agree   2) Slightly Agree   3) Slightly Disagree   4) Disagree

1. I don't have any use for e-mail on a day-to-day basis.
2. Using e-mail in my job has only meant more work for me.
3. I do not think that e-mail is useful to me in my profession.
4. I feel at ease using e-mail.
5. With the use of e-mail, I can perform tasks that enhance my performance on the job.
6. If I use e-mail, I will be more productive.
7. Anything that e-mail can be used for, I can do just as well some other way.
8. The thought of using e-mail makes me anxious.
9. E-mail technology is confusing to me.
10. I use e-mail to access many types of information for my work.
11. I do not feel threatened by the impact of e-mail.
12. I am anxious about e-mail because I don't know what to do if something goes wrong.
13. I communicate more often and/or with more people since using e-mail.
14. I feel comfortable about my ability to work with e-mail .
15. E-mail is an overrated tool for productivity.

**I feel confident...**

16. Reading mail messages on e-mail.
17. Responding to mail messages on e-mail.
18. Sending the same mail message to more than one person on e-mail.
19. Responding privately to messages originally sent to more than one person on e-mail such as in a listserv environment.
20. Forwarding messages received on e-mail.
21. Signing on to listserves/discussion groups.
22. Maintaining files (such as notebooks) to keep and organize e-mail messages.
23. Uploading documents created in a word processing program.
24. Printing messages received on e-mail.
25. Deciding which messages to keep and which to discard.

**My Use of Electronic Mail**

*USING A TYPICAL WORK WEEK AS A POINT OF REFERENCE, PLEASE ESTIMATE*

**THE NUMBER OF TIMES PER WEEK THAT I ...**

- 1) 0    2) 1-4    3) 5-10    4) 11-20    5) Over 20 times

- 26. Send an e-mail message to individual people.
- 27. Send an e-mail message to a distribution list(s).
- 28. Answer someone's previous e-mail message.
- 29. Forward someone an e-mail message.

<b>I USE ELECTRONIC MAIL TO...</b>	never	very often					not applicable
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>9</u>	
30. Send information to people I know							
31. Seek information from people I know							
32. Broadcast requests for information in a listserv or bulletin board environment							
33. Distribute/provide information							
34. Give/receive feedback on reports/ideas							
35. Brainstorm/generate ideas							
36. Monitor progress of projects on which I work							
37. Send/receive assignments from my students							
38. Keep in touch/maintain relationships							
39. Learn about events/things that interest me							
40. Participate in entertaining events (games) or conversations							
41. Schedule meetings/appointments							
42. Coordinate activities of a project							
43. Organize/coordinate a social activity							
44. Take a break from work							
45. Resolve conflicts/disagreements							
46. Advertise/respond to rfp's							
47. Poll opinions on a topic							
48. Resend the same message to a person who may have missed it the first time							
49. Send messages from a home computer							



**APPENDIX B**  
**LETTERS TO SAMPLE OF E-MAIL USERS**

**ATTENTION: FACULTY USERS OF E-MAIL**

If you use e-mail in your work, please consider sharing some information concerning your online experiences.

I am conducting a research project to document the many uses of electronic mail technology. The study is part of my doctoral dissertation in the area of business education under the direction of an advisory committee at Virginia Polytechnic Institute and State University.

You have been selected to participate in this study through a random sampling of electronic mail users at this university. Your experience can help in efforts to develop instruction in effective communication in this unique medium. As a community, we have been using electronic mail for a number of years in a variety of ways not yet experienced by other users of this technology. **Whether you have been using e-mail for some time, have just begun to use it, or have an e-mail address but do not use e-mail, please carefully fill out the enclosed questionnaire.**

The questionnaire gathers information about your work, communication practices, uses of and attitudes toward electronic mail, possible new e-mail features, and your background. It has been designed for easy reading and response; in pretests people have averaged between 10 and 15 minutes to fill it out. All responses are completely confidential; results will be presented in statistical summary only.

After completing the questionnaire, please return it to me by campus mail.

**NOTE: The survey is coded for the sole purpose of contacting non-respondents. All information provided will be confidential.**

*Please return to: Jerry Kandies  
215 Lane Hall  
0254*

**SECTION II** of this study concerns the effectiveness of an individual's communication using e-mail. I plan to collect and analyze e-mail messages to see how well they convey meaning to the intended audience. Would you be willing to send me copies of your non-personal e-mail messages for the period of one week for this content analysis process? The time required for your participation would only be the minute or two that it would take to add my userid to each message.

**YES**

**NO**

If you answer **YES**, I will contact you via e-mail explaining the process in detail.

**NAME** \_\_\_\_\_

**E-MAIL ADDRESS** \_\_\_\_\_

**ATTENTION: FACULTY USERS OF E-MAIL**

About three weeks ago, you received a cover letter and survey instrument in campus mail. Perhaps you have misplaced the survey. I am sending another copy for your convenience.

Please take time now to complete the enclosed copy. I realize that you are extremely busy at this time of the year and appreciate your assistance in providing this information.

*Please return to: Jerry Kandies  
215 Lane Hall  
0254*

APPENDIX C

HOLISTIC GRADING PROCEDURES FOR E-MAIL MESSAGES

## INSTRUCTIONS FOR HOLISTIC GRADING OF E-MAIL MESSAGES

Using your best judgement, rate the communication effectiveness of the message - how well does the writer convey meaning to the reader.

Remember that these messages are not formal business letters. The writer is often assuming a common context with the reader and the message may be part of an ongoing conversation. The "Subject" header is therefore very important in conveying context. Please consider this "subject" line when forming your impression of the quality of communication.

Rate each e-mail message using the "Scale for Evaluating Effective Writing," and the more detailed table on the following page to determine the appropriate rating for each of the four elements.

Proper names have been recoded to insure confidentiality. You are requested to respect the privacy of the writers.

### Scale for Evaluating Effective Writing

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Subscale	Definition
General competence	The overall, or holistic, impression of a piece of writing as to how clearly it communicates a message to the reader.
Focus/organization	The extent to which the topic is clearly indicated and developed in an organized manner.
Support	The extent which ideas are supported by detail. The skillfulness of sentence construction (coherent, unified, and effectively varied).
Mechanics	The extent to which grammar, punctuation, and spelling interfere with the writer's effectiveness in communicating.

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COMPETENCE	FOCUS/ORGANIZATION	SUPPORT	MECHANICS
<p>5 Excellent</p>	<ul style="list-style-type: none"> <li>• subject clear</li> <li>• main idea clear</li> <li>• key points, reasoning at beginning or end</li> <li>• beginning and end relate</li> <li>• plan logical</li> <li>• paragraphs set off <u>all</u> major ideas</li> <li>• no one sentence paragraphs</li> <li>• no digressions</li> </ul>	<ul style="list-style-type: none"> <li>• main idea and all major topics elaborated by more specific detail</li> <li>• enumerations supported by detail and rationale</li> </ul>	<ul style="list-style-type: none"> <li>• one or two minor errors</li> <li>• no gross errors</li> </ul>
<p>4 Good</p>	<ul style="list-style-type: none"> <li>• subject clear</li> <li>• main idea clear</li> <li>• topic partially limited by number or type of key reasons</li> <li>• logical plan</li> <li>• <u>some</u> transitions</li> <li>• <u>most</u> major ideas in paragraphs</li> <li>• minor digression</li> </ul>	<ul style="list-style-type: none"> <li>• almost all major points elaborated by more specific detail</li> <li>• most elaboration is specific</li> </ul>	<ul style="list-style-type: none"> <li>• a few minor errors</li> <li>• may be one gross error</li> <li>• still no problem with usage and mechanics</li> </ul>
<p>3 Adequate</p>	<ul style="list-style-type: none"> <li>• subject clear</li> <li>• main idea clear</li> <li>• topic somewhat limited</li> <li>• plan logical, but sub topic can be reorganized</li> <li>• <u>many</u> major thoughts in paragraphs</li> <li>• few minor digression, no major</li> </ul>	<ul style="list-style-type: none"> <li>• several major points supported</li> <li>• some elaboration is specific</li> </ul>	<ul style="list-style-type: none"> <li>• a few minor errors</li> <li>• one or two gross errors</li> </ul>
<p>2 Poor</p>	<ul style="list-style-type: none"> <li>• subject clear</li> <li>• main idea not very clear or more than one main idea</li> <li>• plan attempted, must infer</li> <li>• few paragraphs logically developed</li> <li>• some major digressions or excessive elaboration</li> </ul>	<ul style="list-style-type: none"> <li>• a few major points supported</li> <li>• may be redundant</li> <li>• may not be precise</li> </ul>	<ul style="list-style-type: none"> <li>• some errors are interfering with comprehension</li> <li>• sentence structure below mastery</li> </ul>
<p>1 Almost Unreadable</p>	<ul style="list-style-type: none"> <li>• subject may be unclear</li> <li>• main idea unclear</li> <li>• plan unclear</li> <li>• almost no logically developed paragraphs</li> <li>• many digressions</li> </ul>	<ul style="list-style-type: none"> <li>• little or no support <u>or</u></li> <li>• support is confusing or at the same level of generality as the main assertion</li> </ul>	<ul style="list-style-type: none"> <li>• many gross errors</li> <li>• difficult to read</li> <li>• very confusing</li> </ul>

## VITA

Jerry Kandies was graduated from Brooklyn Preparatory High School in 1964. He attended the University of Dayton, Ohio, where he received a B.S. degree in Secondary Education in 1968 with a major in English and minor in Business. He received a M.A. in English in 1970, also from the University of Dayton. He received his Doctor of Philosophy degree in Vocational and Technical Education from Virginia Polytechnic Institute and State University in 1994.

Jerry's teaching career began in Trotwood, Ohio, where he taught eighth-grade English for one year before returning to graduate school where he taught Freshman Composition. After receiving his Master's, he returned to his hometown where he taught ninth-grade English for five years at Massapequa High School. He has also taught a variety of computer application courses at the adult education, community college, and university levels.

Jerry has also been an entrepreneur and a social worker. He owned and operated a health food store for over 10 years in Independence, Virginia. He worked as a substance abuse prevention specialist while employed by Mt. Rogers Mental Health, Mental Retardation and Substance Abuse Services.

He is currently an assistant professor of computer information systems at Delta State University in Cleveland, Mississippi. He teaches courses in computer applications, systems analysis and design, and management information systems.

*Jerry T. Kandies*