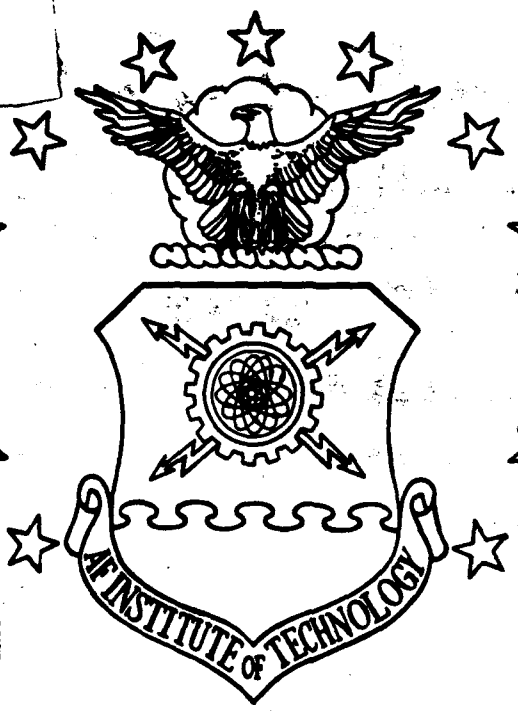

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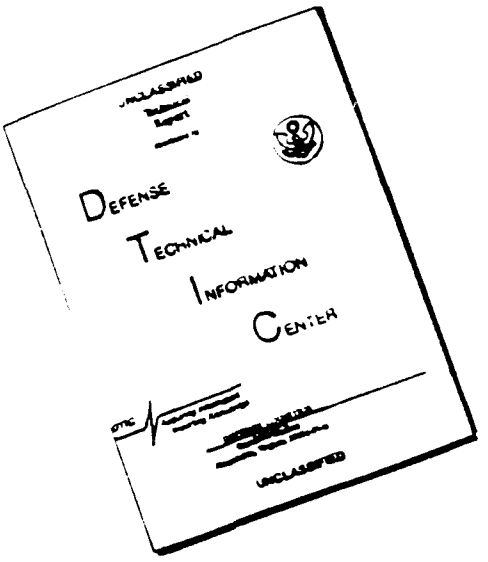

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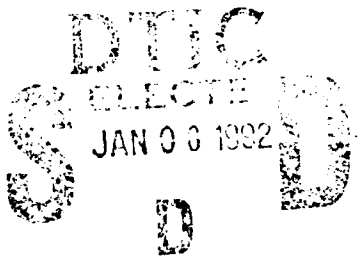

A STUDY OF THE ADOPTION AND EFFECTIVENESS OF ELECTRONIC MAIL AT THE AIR FORCE INSTITUTE OF TECHNOLOGY

THESIS

Douglas D. White, Captain, USAF

AFIT/GIR/LSY/91D-13

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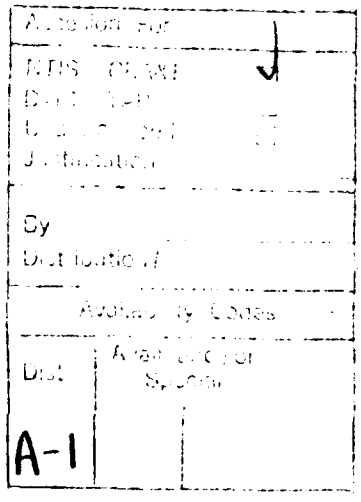

AFIT/GIR/LSY/91D-13

A STUDY OF THE ADOPTION AND EFFECTIVENESS OF ELECTRONIC MAIL AT THE AIR FORCE INSTITUTE OF TECHNOLOGY

THESIS

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Information Resource Management

Douglas D. White, B.S.

Captain, USAF

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Douglas D. White

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Abstract

This research investigated the relationship between the adoption and effectiveness of electronic mail at the Air Force Institute of Technology's School of Systems and Logistics (LS).

In this research, theories concerning innovation adoption and measurement of system effectiveness are discussed. Survey instruments from both areas were selected, tested, and used to collect data from the LS faculty and staff. Correlation analysis was performed using the data collected.

Findings indicate a correlation does exist between the adoption of electronic mail and the effectiveness surrogate measurement, user satistaction. There was a significantly strong negative correlation between electronic mail complexity and user satisfaction.

A STUDY OF ADOPTION AND EFFECTIVENESS OF ELECTRONIC MAIL AT THE AIR FORCE INSTITUTE OF TECHNOLOGY

I. Introduction

Throughout history, there has existed among the human race a desire to communicate. Through the centuries technological breakthroughs have advanced us from the archaic means of communication of the past. What once took months and days can now be done in minutes and seconds with the right equipment.

In some ways communication has not improved as much as we would like to think. Many people still spend a great deal of their time playing "phone tag" or chasing down people to get a message to them. This can significantly slow down communication and often frustrates the communicator (18:97). One technological advancement that may alleviate some obstacles is computer-mediated communication.

Background

Computer-mediated communication is fast becoming a mainstay in today's society. One of the most common and widely used forms emerging is electronic mail (8:48). Electronic mail, or e-mail as it is known, is a message system capable of delivering textual communications from a sender to one or more recipients by an automated electronic network.

Many advantages can be associated with the use of e-mail. Flexibility is a key one in that each user is in control. Mail is sent at the convenience of the sender and received at the convenience of the receiver. Large or small amounts of e-mail may be sent to a local or distant location, even at the same time.

> Computer mail is a writing medium, but it is more versatile than paper memoranda and postal mail. People can exchange any text-messages, documents, datafiles, even computer conferences consisting of conversations of many people. (8:48)

There also exists a potential for time-savings. "E-junk" can be discarded quickly and permanently. Mechanical typewriting and correction of errors is replaced by much more efficient keyboarding. Multiple contacting does not require the minutes, hours, or days consumed by phone calls,

meetings, or delivery of regular mail. Retention and reproduction features allow a particular message to be sent once and only once, or as often as desired. A user also has the capability of simultaneous reception and storage of return messages in large numbers (15:424).

The need for precision in today's communication is met as e-mail is generated by a system which is capable of printing each written character exactly the same way every time, which eliminates the necessity of decoding illegible handwriting. Some tasks are programmable, which offsets the influence of human fatigue or emotional fluctuation, which in turn can reduce the frequency of errors. Mistakes that do occur are more easily corrected as the message is written on an electronic medium rather than a physical form (15:424).

Electronic mail can even replace paper for communication and record-keeping promoting better organization.

> There are no tangible artifacts. Messages are composed on and read from video terminals (rather than teletype machines) with no hard copy left behind. It is possible to store messages on computer files and to create hard copies of them, but most messages are never put on paper; and if stored, they are stored electronically. (8:48)

The potential reduction of sloppiness in the working environment can be a major justification for purchase of an e-mail system. Electronic records not only require less frequent physical replacement or correction than paper records, but are more easily changed when such is needed. Electronic storage requires less physical space and makes better use of the space it takes, compared with more conventional methods.

General Issue

With all of these features e-mail could revolutionize communication within an organization, but they do not guarantee its success in an organization. Individual users may not be satisfied with the system being used in their particular organization. An individual who is not satisfied with e-mail may not use it, and any advantages e-mail may have are lost if the system is not used.

Specific Problem

The Air Force Institute of Technology has invested in electronic mail systems that span its organization. The School of Systems and Logistics looks to e-mail to help "ensure open lines of communication in all directions" and

"encourage a ready crossflow of ideas between faculty and administration (3:19)." If its e-mail system goes unused, crucial budget money and time may be wasted in support of an ineffective communications system. This could lead to pertinent information failing to reach its intended recipient.

Research Objective

The purpose of this research is to investigate the relationship, is any, between adopting an information technology innovation and the effectiveness of an information technology innovation. The specific innovation that will be investigated is electronic mail, as used by the faculty and staff at the Air Force Institute of Technology School of Systems and Logistics.

Thesis Overview

Chapter II begins with an overview of the theory of innovation diffusion and the development of an instrument to measure the characteristics of innovation adoption. The latter part of the chapter discusses the measurement of information system effectiveness. Chapter III outlines the specific methods that will be used in this research to

measure innovation adoption characteristics and system effectiveness. Chapter IV examines the results of these measurements and Chapter V provides recommendations and conclusions that were drawn from this research.

II. Literature Review

Introduction

This chapter begins with an overview of the diffusion of innovation theory. A few examples of where it has been used are given and the development of an instrument to measure the characteristics of innovation adoption is then discussed. The latter part of the chapter focuses on effectiveness, in the context of information systems (IS), and establishes accepted measures for IS effectiveness.

Diffusion of Innovation Theory

The diffusion of an innovation is conceptualized as the process by which knowledge of an innovation spreads throughout a population, eventually to be adopted or not, by an individual, an organization, or another decision-making unit in the population (2:162). When discussing the theory of diffusion of innovation, it is important to first establish a definition of diffusion. Everett Rogers defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system (13:5)." An analysis of this definition

identifies four distinct elements that the theory is organized around: an innovation, communication, time, and a social system. To understand the theory, one needs to understand the four components and the ways in which they relate (2:162).

The definition of the first element, the innovation, has a very broad interpretation. It can be an idea, a practice, or an object that appears new to the individuals or other units of adoption within a social system (2:162,13:11). They are not necessarily single items. They may be part of a "technological cluster," one or more distinguishable technology elements that are perceived as being closely related (13:14).

Diffusion theory asserts that certain characteristics of the innovation influence its rate of adoption (2:162,13:15). These characteristics include: relative advantage, compatibility, complexity, trialability, and observability. Rogers defines these terms as follows:

> **Relative advantage** is the degree to which an innovation is perceived as better than the idea it supersedes;
>
> **Compatibility** is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters;

> **Complexity** is the degree to which an innovation is perceived as difficult to understand and use;
>
> **Trialability** is the degree to which an innovation may be experimented with on a limited basis; and
>
> **Observability** is the degree to which the results of an innovation are visible to others. (13:15-16)

Rogers adds that there are other characteristics that affect the rates of adoption, but past research indicates that these are the most significant ones (13:16).

The second element of diffusion theory is communication, "the creation and sharing of information about innovations (2:162)." Obviously, communication is more likely between individuals who are alike. This is known in diffusion theory as homophily, "the degree to which pairs of individuals who interact are similar in certain attributes, such as beliefs, education, social status, and the like (13:18)." Communication is more likely to be effective and rewarding when two individuals are homophilous (13:19).

Time is the third aspect of the diffusion of innovation process. There are three ways in which time is involved in diffusion. The first is in the innovation-decision process,

> ...the process through which an individual (or other decision-making unit) passes from first knowledge of an

> innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision. (13:20)

These five steps usually occur in sequence and the length of time required for this process is referred to as the innovation-decision period (13:21).

The second way that time is involved is identified as innovativeness. This refers to the amount of time involved, relative to other members of the social system, for an individual to adopt new ideas. Adopter categories identify members of the social system based on their innovativeness. The adopter categories include: innovators, early adopters, early majority, late majority, and laggards (13:22). Specific variables such as socioeconomic-status levels, personality, and communication behaviors, are associated with each of the categories (2:163). Each category plays a role in the flow of ideas through the given social system and can identify how communication can be tailored to each audience (2:163,13:22).

The third way time is involved is the relative speed in which members of the social system adopt an innovation. The rate of adoption is usually measured by the length of time required for a certain percentage of social system members

to adopt the innovation (13:23). Different innovations will have different rates of adoption within a social system, just as there will be differences in the rate of adoption for the same innovation in different social systems. Innovations that are perceived as possessing high degrees of the five innovation characteristics will have a more rapid rate of adoption (13:23).

The fourth and final component of the organization of diffusion theory is the social system. It is comprised of a set of interrelated individuals, units, or organizations using collective problem solving to accomplish a common purpose (2:164,13:24). A social system has social structure and communication structure. Social structure is the "patterned social relationships among the members of a system" while communication structure is "the differentiated elements that can be recognized in the patterned communication flows in a system (13:25)." These structures influence the diffusion of innovations in the social system.

There are many other influences to diffusion within a social system. One of which is the established behavior patterns or norms of the system members. Another influence is the type of innovation-decisions that must be made.

These types include:

> Optional innovation-decisions, choices to adopt or reject an innovation that are made by an individual independent of the decisions of other members of the system;
>
> Collective innovation-decisions, choices to adopt or reject an innovation that are made by consensus among the members of the system;
>
> Authority innovation-decisions, choices to adopt or reject an innovation that are made by relatively few individuals in a system who possess power status, or technical expertise; and
>
> Contingent innovation-decisions, a sequential combination of two or more of these types in which choices to adopt or reject can be made only after a prior innovation-decision. (13:37)

Another way in which the social system is involved in the diffusion of innovations is the consequences of the innovations. Consequences are the changes that occur to the social system, or an individual within the social system, as a result of the adoption or rejection of an innovation (13:37).

> An innovation has little effect until it is distributed to members of a system and put to use by them. Thus, invention and diffusion are but means to an ultimate end: the consequences from adoption of an innovation. (13:371)

Many researchers have given little attention to the study of consequences, often assuming that adoption of an innovation will produce only beneficial results. This assumption,

known as the pro-innovation bias, is obviously a false one. "Every innovation produces social and economic reactions that run throughout the social structure of the client system (13:372)." Not all of these reactions are of a positive nature (13:372-374).

This section has looked at the diffusion of innovations and defined the four main elements that it is organized around: the innovation, communication, time, and the social system. The next section will address areas in which it has been applied.

Areas of Use. "The two most important disciplines in the early years of diffusion of innovation studies were anthropology and sociology (9:13)." Anthropology viewed it as an explanation of the social change brought about by innovations introduced from outside the society or social system. These studies showed that the probability of adoption increases relative to the degree of the innovation's compatibility with the particular culture. While research in these areas declined in the 1950s, other academic disciplines became interested in diffusion theory. These areas included education, medicine, rural sociology and agriculture (9:13,14).

Education studies typically looked at teaching/learning techniques and innovations such as team teaching, programmed instruction, and modern math. This final area encompasses "the best piece of educational diffusion research," Doctor Richard Carlson's 1965 study of how modern math spread through Pennsylvania and West Virginia school administrators (13:64). In this study he analyzed the leadership opinion patterns in the diffusion networks among superintendents.

This focus on interpersonal networks in diffusion was a great step forward, but the most interesting point to emerge is that educational innovations seem to take much longer to diffuse than do medical or agricultural innovations. One reason suggested for this difference is the lack of change agents to promote new ideas in the educational circles. "Teachers are not subject to the promotional material and the attentions of sales people to the same extent as farmers and doctors (9:13)."

The medical and agricultural disciplines have become very concerned with the diffusion of innovations. One of the most noted studies in rural sociology and agriculture was the Ryan and Gross study of the diffusion of hybrid seed corn (9:13,13:32). "It is an ideal illustration because the

hybrid corn investigation includes each of the four main elements of diffusion (13:32)."

An important diffusion study of a medical innovation was carried out in 1954 at Columbia University. This study was concerned with a new antibiotic and its diffusion among doctors in four Illinois cities. Other studies have looked at the diffusion of new vaccines, health practices, and family planning practices, especially in the third world.

More recently, though, the potential applicability of the diffusion of innovation theory to problems related to the adoption of technological innovations has been suggested (2:161,11:1).

Instrument Development. "The adoption of information technologies by individuals and organizations is part of the process of information system implementation (11:1)." This is an area receiving a lot of recent attention, but still lacking in many areas. In their paper, "Development of an Instrument to Measure the Perceived Characteristics of Adopting an Information Technology Innovation," Moore and Benbasat point to several factors that "have plagued IS research (11:1)." Two of the most serious ones are the lack of a "cumulative tradition in IS" and "poor theory

development (11:1)." They further point out the inadequate measurement of constructs and that without good theory there cannot be well defined constructs. Nor can there be operationalization of these constructs, all of which are prerequisites "for the beginning of a cumulative tradition (11:1)." In order to overcome these weaknesses in IS research, Moore and Benbasat, as well as others, are looking to the theories of innovation diffusion (11:1).

Moore and Benbasat tested the five characteristics of an innovation identified by Rogers, relative advantage, compatibility, complexity, trialability, and observability (13:15-16) plus two others they felt were needed. The first was image, defined as "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system (11:4)." The other was voluntariness of use, defined as "the degree to which use of the innovation is perceived as being voluntary, or of free will (11:4)."

From their testing Moore and Benbasat determined to slightly modify the characteristic definitions.

> Rogers' definitions are based on perceptions of the innovation itself, and not on perceptions of actually using the innovation... Innovations diffuse because of the cumulative decisions of individuals to adopt them. Thus, it is not the potential adopters' perception of

> the innovation itself, but rather their perceptions of **using** the innovation that are key to whether the innovation diffuses... Thus, all characteristics were redefined in terms of potential adopters use, trial or observation of the innovation, and labeled the **Perceived Characteristics of Innovating (PCI).** (11:5)

After a literature search for previously developed and evaluated tests/scales for each characteristic, Moore and Benbasat developed and tested an overall instrument to measure all PCI. Although the instrument was developed and tested with a specific information technology (IT) innovation, the personal work station, the authors' support the idea of substituting other IT innovations into the instrument (11:20). This will be done for this thesis. Further discussion of the actual instrument will take place in chapter III.

Measuring the characteristics of adopting e-mail is only the first part. Determining whether innovation adoption and its characteristics are correlated with system effectiveness is the ultimate goal of this research. The next section of this chapter discusses system effectiveness, in terms of information systems, and acceptable surrogate measurements for system effectiveness.

Measuring System Effectiveness

Finding a way to measure the effectiveness of information systems technology has been a difficult and on going struggle (14:243,16:203,12:173). Many approaches and surrogate measures have been suggested. "The spectrum of approaches that have been suggested to deal with this complex issue presents a bewildering array to a researcher (14:243)." Approaches that have been suggested include economic analyses, such as cost-benefit analysis, actual usage, and user perceptions. Srinivasan acknowledges the importance of the economic analyses, but states that the focus of much of the literature is on usage or user perceived effectiveness (14:243).

In his article on finding a measurement of effectiveness, Ginzberg argues that "'use,' by itself, is an inadequate measure of effectiveness (4:59)." Melone adds, in her article, "A Theoretical Assessment of the User Satisfaction Construct in IS Research," that "user satisfaction alone is not sufficient to adequately capture the full meaning of effectiveness (10:88)." "It is apparent that both system usage and user perceived effectiveness play roles in determining the effectiveness of an MIS (14:244).

A positive association between usage and satisfaction has also been consistently observed (19:923); therefore, use of both approaches may be warranted in many situations (14:244, 7:786).

User Satisfaction. "The literature generally agreed that satisfaction in a given situation is the sum of one's feelings or attitudes toward a variety of factors affecting that situation (1:531)." The Bailey/Pearson article, "Development of a Tool for Measuring and Analyzing Computer User Satisfaction," from which this quote is taken, is considered one of the benchmarks for user satisfaction study (10:76,16:203,5:740,7:785).

In their article, Bailey and Pearson established thirty-nine factors that affect user satisfaction with computers, and developed a questionnaire to measure satisfaction from them. Flexibility of the questionnaire is a major aspect of this instrument. It is possible to use only a preselected number of the thirty-nine factors, rather than all of them, for a specific situation. In addition, questions can be made clearer for a specific situation by using user community vocabulary (1:539). Bailey and Pearson recommended future development of their measurement

instrument. Ives, Olson, and Baroudi were one of the first groups to undertake that mission.

In their study, Ives, Olsen, and Baroudi were interested in finding a sound tool for the measurement of user information satisfaction. They reviewed four measures and selected the Bailey/Pearson measure because it best met their requirements of being an "empirically derived measure, with adequate empirical support, which covers both the information system product and general system services and provides multiple indicators" (7:788).

The rest of their paper was devoted to assessing "the validity and reliability of [Bailey &] Pearson's measure and to refine it for use in research and practice" (7:788). They conclude their article with the feeling that their work has helped produce a better instrument and they encourage to the MIS research community "to choose a standard instrument" (7:792).

Louis Raymond selected the Ives et al modified Bailey/Pearson measure. He based this selection on four criteria:

> 1) The instrument should not only measure user attitudes toward the MIS product, but also toward MIS services; 2) The instrument should be oriented

> toward implementation of organizational MIS rather than the development of specific subsystems; 3) The instrument should be usable across organizations; and 4) The instrument should be short and easy to answer. (12:174)

In his study he broadened the domain of reliability and validity of the instrument and developed it to contribute further to "a better understanding of the specific aspects of small organizations in regards to information systems (12:178)." Increased knowledge of the MIS success factors is needed, concluded Louis, "if organizations are to respond effectively to the unique problems and opportunities which confront them (12:175)."

Tan and Tak recognized this need also. Their evaluation of previously developed instruments that measure user satisfaction "led to the selection of that of Pearson and Bailey" also (16:204). They chose to modify it themselves by using only thirty-three of the thirty-nine original factors and by modifying some of the factor titles. One other significant change to the measure was the use of a seven-point Likert scale, instead of the original semantic differential scale. A measurement study was done to investigate the reliability and validity of the modified instrument. Tan and Tak concluded, much like Louis, that

their study had "broadened the applicability of the measurement instrument (16:208)."

Hiltz and Johnson, however, write that the factors used in the Bailey/Pearson instrument are "generally not applicable to computer-mediated communication systems as contrasted to management information systems (5:740)." They do agree with Bailey and Pearson that "an accepted measure of user satisfaction is clearly needed" and their work "identifies the factors which comprise subjective satisfaction with computer-mediated communication systems (5:739)." They use an instrument designed specifically to investigate the determinants of acceptance, of which subjective satisfaction is a dimension, of computer-mediated communication systems (6:i). It is from this instrument that an instrument will be developed for this thesis. Further discussion of the actual instrument will take place in Chapter III.

As mentioned earlier in this section, user satisfaction is by no means the only accepted surrogate measure of effectiveness. The concluding section of this chapter will briefly discuss actual use of a system as a means of determining system effectiveness.

Usage. "Utilization of an information system is an important and frequently measured MIS variable, since use of a system is the conduit through which information technology can affect performance (17:227)." In his work, "Utilization as a Dependent Variable in MIS Research," Trice reviews the existing research literature and determines that "the linkages between utilization and its determinants are not well understood (17:235)." He asks the question, "How can the determinants of utilization be better understood (17:236)?" One of the first steps is to choose a definition of utilization, but there are many different ones (17:236). "One consequence of the lack of consistency in utilization definitions in MIS research is the lack of consistency of utilization measures as well (17:236)." In order to adopt standard measures a standard definition is needed and "this is inappropriate since utilization is process dependent (17:236)." Trice's solution, or "the best we can hope for", is to "adopt standardized measures within the context of a single theory based on the definition of utilization the reference theory suggests (17:236)."

Another issue of concern is the use of objective utilization measures.

> Even though machine usage statistics are routinely logged and readily accessible (at least in the case of mainframe computer systems), thus far they have been employed far less frequently than self-reported measurements in the literature. It is recommended that researchers use machine usage measures rather than the more subjective self-reported measures whenever possible, since as a rule objective measures are more accurate. Care must be exercised in the selection of objective machine usage measures, however. (17:226)

As Trice and Treacy point out, the routinely logged machine usage statistics are not always directly applicable to a given research problem. In this study, usage measures are not readily available in a form directly applicable to the research problem.

Summary

This chapter has examined the two areas that will be used in this research: the theory of innovation diffusion and information system effectiveness. Means of measuring both have been drawn from a review of the literature and the next chapter will discuss the means in detail and how they will be implemented.

III. Methodology

Introduction

This chapter outlines the methods used to address the specific problem stated in Chapter I. It first discusses the population of interest, then addresses the method used to collect data in the two areas of concern: the characteristics of innovation adoption and system effectiveness, and concludes with a focus on how this data will be correlated.

Population

The population of interest for this research is the faculty and staff of the Air Force Institute of Technology School of Systems and Logistics (AFIT/LS). Since this is a relatively small (150), accessible group, a census was possible. The only potential problem anticipated with collecting data on the entire population was the level of non-respondents.

Measurement Instrument

Innovation Adoption. A survey instrument developed by Moore and Benbasat was used to collect data on the various

perceptions the AFIT/LS faculty and staff had on adopting electronic mail as a means of communication. This instrument was developed for the express purpose of collecting data on the perceptions an individual may have of adopting an information technology (IT) innovation, and is intended as a tool for studying IT adoption and diffusion within organizations (11:19).

Items to measure the characteristics were both newly created as well as drawn from existing instruments. All items were placed in a common pool and subjected to four rounds of sorting procedures to establish what items should be in the various scales. The objective of the sorting was to verify the validity of the scales as part of the development process. Moore and Benbasat did this by examining how groups of judges sorted the items into various construct categories. Scales for the resulting constructs were subjected to three separate field tests. Following the last test, the scales all demonstrated acceptable levels of reliability. Moore and Benbasat further checked validity using factor analysis. The result was a thirty-six question innovation adoption survey instrument, comprising seven scales (Appendix A: Part II).

Moore and Benbasat's original instrument was developed using personal work stations (PWS) as the innovation. For the purposes of this research, the instrument has been modified to reflect electronic mail as the innovation. It was pretested by surveying 20 AFIT students. Adjustments were made based on respondents' comments.

User Satisfaction. A survey instrument developed by Hiltz, Kerr, and Johnson was used to collect data on the subjective satisfaction the AFIT/LS faculty and staff had of e-mail as a means of communication. This instrument consists of fourteen items used in Hiltz, Kerr, and Johnson's acceptance follow-up questionnaire that dealt specifically with probing "the users' reaction to the system as a means of communication and work" (5:749).

All items had been used in previous computer-mediated communications studies. Item analysis indicated that each of the fourteen had produced acceptable variability and internal validity. Principal axis factor analysis was used to identify dimensions or constructs that underlie these items. Hiltz, Kerr, and Johnson state:

> There is no generally accepted coefficient to measure the reliability of factor scales based upon principal axis factor analysis. However, the coefficient Omega

> does provide an overall estimate of the reliability of all the common factors in a given set. (5:749)

For the factor structures for their data, "Omega was an acceptably high 0.918 (5:749)."

Data Analysis

Cronbach's alpha was calculated as a reliability check of each group of variables. Means and standard deviations were also computed. Correlation analysis, using a .05 significance level, was used to address the specific research objective.

Summary

This chapter has examined the methods used for this research. The population of interest is defined. The measurement instrument used and its validation are discussed. Also, reliability and the analysis techniques to be used in Chapter IV are presented.

IV. Results

Introduction

This chapter discusses the results yielded by the survey instrument and the statistical procedure that will be used. Break outs of the responses by demographic categories are displayed, as are the means and standard deviations to each question. Reliability of the instrument is discussed and the Cronbach's alphas of each variable grouping are displayed. The chapter winds up with a short description of the analysis technique that was used on the data.

Survey Results

Of the 150 survey instruments sent out, 87 were returned within 14 days. Of these 87 received back, four were returned not completed due to personnel absences, and three were unusable due to inadequate responses in Sections II and III. This left a total of 80 usable responses (53.3% usable response rate) to make up the database.

The demographic breakout of the respondents is shown in Tables 1 through 9. The variables from both sections are shown in Tables 10 and 11 with their means and standard deviations. The raw data is contained in Appendix B.

TABLE 1

SURVEY BREAKOUT BY MILITARY BRANCH

BRANCH	NUMBER	PERCENTAGE
AIR FORCE	35	43.75
ARMY	1	1.25
NAVY	3	3.75
NOT APPLICABLE	40	50.00
MISSING RESPONSES	1	1.25
TOTAL	80	100.00

TABLE 2

SURVEY BREAKOUT BY DESIGNATION

DESIGNATION	NUMBER	PERCENTAGE
CIVILIAN	40	50.00
ENLISTED	2	2.50
OFFICER	37	46.25
MISSING RESPONSES	1	1.25
TOTAL	80	100.00

TABLE 3

SURVEY BREAKOUT BY GENDER

GENDER	NUMBER	PERCENTAGE
FEMALE	13	16.25
MALE	67	83.75
TOTAL	80	100.00

TABLE 4

SURVEY BREAKOUT BY AGE

AGE GROUP	NUMBER	PERCENTAGE
21 - 30	8	10.00
31 - 40	26	32.50
41 - 50	24	30.00
51 - 60	13	16.25
OVER 60	9	11.25
TOTAL	80	100.00

TABLE 5

SURVEY BREAKOUT BY HIGHEST EDUCATION LEVEL

LEVEL OF EDUCATION	NUMBER	PERCENTAGE
HIGH SCHOOL DIPLOMA OR GED	4	5.00
SOME COLLEGE, BUT NO DEGREE	6	7.50
ASSOCIATE'S DEGREE	2	2.50
BACHELOR'S DEGREE	1	1.25
MASTER'S DEGREE	27	33.75
GRADUATE WORK PAST MASTER'S	9	11.25
DOCTORAL DEGREE	30	37.50
MISSING RESPONSES	1	1.25
TOTAL	80	100.00

TABLE 6

SURVEY BREAKOUT BY ACADEMIC RANK

RANK	NUMBER	PERCENTAGE
INSTRUCTOR	15	18.75
ASSIS PROF	25	31.25
ASSOC PROF	14	17.50
PROFESSOR	11	13.75
NOT APPLICABLE (STAFF)	14	17.50
MISSING RESPONSES	1	1.25
TOTAL	80	100.00

TABLE 7

SURVEY BREAKOUT BY PROGRAMS TAUGHT

PROGRAM	NUMBER	PERCENTAGE
PCE ONLY	14	17.50
MOSTLY PCE	20	25.00
EQUAL PCE AND GRADUATE	2	2.50
MOSTLY GRADUATE	14	17.50
GRADUATE ONLY	15	18.75
NOT APPLICABLE (STAFF)	14	17.50
MISSING RESPONSES	1	1.25
TOTAL	80	100.00

TABLE 8

SURVEY BREAKOUT BY YEARS AT AFIT

YEARS	NUMBER	PERCENTAGE
LESS THAN 01	12	15.00
01 - 02	6	7.50
02 - 04	19	23.75
04 - 05	7	8.75
05 - 10	20	25.00
10 - 15	3	3.75
15 - 20	3	3.75
OVER 20	9	11.25
MISSING RESPONSES	1	1.25
TOTAL	80	100.00

TABLE 9

SURVEY BREAKOUT BY SYSTEM USED FOR E-MAIL

SYSTEM	NUMBER	PERCENTAGE
BLACKBIRD (SSC)	2	2.50
CLUSTER (ISC OR CSC)	6	7.50
GALAXY (LCC)	1	1.25
PHANTOM (AFIT/CC)	67	83.80
OTHER	2	2.50
DO NOT USE E-MAIL	2	2.50
TOTAL	80	100.00

TABLE 10

SECTION II MEANS AND STANDARD DEVIATIONS

QUESTION #	NAME	NUMBER	MEAN	STD DEV
10	RA1	80	4.7750	1.5989
11	RA2	80	4.1125	1.3870
12	RA3	80	4.5750	1.6518
13	RA4	80	4.1500	1.5352
14	RA5	79	4.8481	1.6571
15	RA6	80	4.4250	1.5490
16	RA7	80	4.0125	1.5791
17	RA8	80	4.4000	1.7255
18	VOL1	79	3.1139	1.7758
19	VOL2	79	4.7722	1.9279
20	VOL3	79	4.0886	2.0828
21	VOL4	79	4.2785	2.1058
22	COM1	80	4.0750	1.8744
23	COM2	79	4.3038	1.8352
24	COM3	80	4.7875	1.6202
25	COM4	80	4.7750	1.6037
26	PLEX1	80	4.2625	1.8674
27	PLEX2	80	3.1500	1.6021
28	PLEX3	79	4.5063	1.9073
29	PLEX4	80	4.1375	1.4989
30	PLEX5	80	3.8625	1.5157
31	PLEX6	80	3.4750	1.5588
32	SEE1	78	4.8718	1.4715
33	SEE2	78	4.3846	1.8392
34	SEE3	79	4.7215	1.7092
35	SEE4	79	4.4937	1.5096
36	SEE5	79	4.4430	1.6072
37	SEE6	79	4.8481	1.6020
38	AVAIL1	79	5.5316	1.2992
39	AVAIL2	79	3.8987	1.8158
40	AVAIL3	78	3.7051	1.7809
41	AVAIL4	79	3.8987	1.8158
42	IMAGE1	79	3.3671	1.7481
43	IMAGE2	80	2.9500	1.7639
44	IMAGE3	79	3.1646	1.7934
45	IMAGE4	80	2.9375	1.6865

TABLE 11

SECTION III MEANS AND STANDARD DEVIATIONS

QUESTION #	NAME	NUMBER	MEAN	STD DEV
46	OVERALL	80	4.3125	1.2984
47	STIM	80	3.8000	1.2569
48	UNDER	79	4.1139	1.5606
49	COURT	79	3.9620	1.2449
50	HARD	80	3.8250	1.5159
51	IMPER	80	3.7500	1.1960
52	FRUST	80	3.6750	1.4122
53	WASTE	80	4.3500	1.5679
54	UNPRO	80	4.6625	1.3402
55	DISTRACT	78	3.9231	1.4484
56	CONSTRA	77	3.9610	1.4368
57	OVERLOAD	78	4.0769	1.6098
58	EXPRESS	76	4.2632	1.4456
59	IMPRESS	77	3.8701	1.4541

Reliability

To assess the reliability of the measures used in each section, the Cronbach's alpha procedure was used. Variables in Section II, Adoption of Electronic Mail, were grouped into the seven innovation adoption categories: Relative Advantage (RA), Voluntariness (VOL), Compatibility (COM), Complexity (PLEX), Observability (SEE), Trialability (AVAIL), and Image (IMAGE). The variables were also tested as a whole using the variable name ADOPT. The reliabilty coefficients for Section II are shown in Table 12.

Variables from Section III were tested in three groups. Group one, OVER, consisted of questions 46 through 49 which all dealt with overall satisfaction with electronic mail. Group two, REACT, consisted of questions 50 through 54 which all dealt with specific reactions to using electronic mail. The final group, FELT, consisted of questions 55 through 59 which all dealt with feelings about using electronic mail. The variables were also tested as a whole group with the variable name SATISFY. The reliability coefficients for Section III are shown in Table 13.

The reliability of the survey instrument to measure innovation adoption and user satisfaction is quite strong as indicated by the Cronbach's alphas displayed.

TABLE 12

SECTION II RELIABILITY COEFFICIENTS

NAME	DESCRIPTION	COEFFICIENT
RA	RELATIVE ADVANTAGE	0.969
VOL	VOLUNTARINESS	0.849
COM	COMPATIBILITY	0.929
PLEX	COMPLEXITY	0.894
SEE	OBSERVABILITY	0.774
AVAIL	TRIALIBILITY	0.839
IMAGE	IMAGE	0.894
ADOPT	SECTION II AS A WHOLE	0.821

TABLE 13

SECTION III RELIABILITY COEFFICIENTS

NAME	DESCRIPTION	COEFFICIENT
OVER	OVERALL IMPRESSION	0.814
REACT	REACTION TO SPECIFICS	0.876
FELT	FEELINGS ABOUT USING	0.501
SATISFY	SECTION III	0.891

Correlation Analysis

The correlation procedure on Statistical Analysis Software (SAS) was used to analyze the data to determine if a relationship exists between innovation adoption and effectiveness. Correlation analysis was performed using several different groups of variables. Table 14 shows the results of the seven adoption categories, RA, VOL, COM, PLEX, SEE, AVAIL, and IMAGE with the fourteen separate satisfaction variables of Section III. Table 15 is the results of the seven adoption categories with the three satisfaction categories, OVER, REACT, and FELT. It also includes the all encompassing category SATISFY. Finally, Tables 16 and 17 are the correlation analysis of all the adoption variables as a whole, ADOPT, with each of the

separate satisfaction variables, the three satisfaction categories, and the overall category, SATISFY.

TABLE 14

CORRELATION ANALYSIS:
7 ADOPTION CATEGORIES VS. 14 SATISFACTION VARIABLES
(PEARSON CORRELATION COEFFICIENT / PROB)

	RA	VOL	COM	PLEX	SEE	AVAIL	IMAGE
OVERALL	.4815	-.1063	.5645	-.6886	.2612	.4068	.2243
	.0001	.3576	.0001	.0001	.0209	.0002	.0469
STIM	.4796	-.2119	.4972	-.5759	.2715	.2602	.2837
	.0001	.0643	.0001	.0001	.0162	.0223	.0113
UNDER	.2694	-.0049	.3573	-.6449	.2145	.2975	.1134
	.0171	.9660	.0013	.0001	.0610	.0091	.3227
COURT	.2699	-.0267	.3142	-.5989	.1238	.3482	.0834
	.0168	.8189	.0051	.0001	.2835	.0021	.4675
HARD	.2394	-.0502	.2329	-.6823	.2754	.3531	.0460
	.0336	.6644	.0388	.0001	.0147	.0016	.6871
IMPER	.3020	-.0919	.2772	-.5723	.2244	.4131	.1068
	.0069	.4263	.0134	.0001	.0482	.0002	.3487
FRUST	.2783	-.0734	.3866	-.7284	.1774	.2517	.1909
	.0130	.5255	.0004	.0001	.1203	.0272	.0918
WASTE	.5071	-.0089	.5309	-.5770	.3610	.4214	.0727
	.0001	.9387	.0001	.0001	.0012	.0001	.5243
UNPRO	.5315	-.0796	.5591	-.5931	.3144	.3098	.1189
	.0001	.4911	.0001	.0001	.0050	.0061	.2966
DISTRACT	.0111	.1180	.1562	-.4358	.0783	.2106	.1617
	.9235	.3132	.1749	.0001	.5015	.0697	.1600
CONSTRA	.0698	-.1849	.1651	-.3728	.0989	.3566	.0347
	.5492	.1147	.1539	.0009	.3987	.0018	.7658
OVERLOAD	.1967	.1517	.2318	-.2358	.1679	.1987	-.0856
	.0864	.1760	.0425	.0390	.1470	.0875	.4592
EXPRESS	.2582	-.2471	.3747	-.1764	.2045	.0848	.0608
	.0243	.0350	.0009	.1301	.0804	.4723	.6041
IMPRESS	.3881	-.1302	.3777	-.1711	.4696	.3288	.1309
	.0005	.2688	.0008	.1394	.0001	.0042	.2596

TABLE 15

CORRELATION ANALYSIS:
7 ADOPTION CATEGORIES VS. 4 SATISFACTION CATEGORIES
(PEARSON CORRELATION COEFFICIENT / PROB)

	RA	VOL	COM	PLEX	SEE	AVAIL	IMAGE
OVER	.4617	-.1034	.5353	-.7801	.2703	.4076	.1327
	.0001	.3739	.0001	.0001	.0174	.0003	.2468
REACT	.4549	-.0706	.4892	-.7722	.3327	.4285	.1282
	.0001	.5419	.0001	.0001	.0029	.0001	.2600
FELT	.3209	-.1106	.4346	-.4879	.3388	.4396	.0973
	.0047	.3514	.0001	.0001	.0032	.0001	.4064
SATISFY	.4701	-.1160	.5465	-.7782	.3473	.4898	.1444
	.0001	.3317	.0001	.0001	.0026	.0001	.2196

TABLE 16

CORRELATION ANALYSIS:
"ADOPT" VS. 14 SATISFACTION VARIABLES
(PEARSON CORRELATION COEFFICIENT / PROB)

OVERALL	STIM	UNDER	COURT	HARD	IMPER	FRUST
.3528	.4271	.2222	.2387	.1420	.2695	.1896
.0024	.0002	.0625	.0450	.2341	.0220	.1106

WASTE	UNPRO	DISTRACT	CONSTRA	OVERLOAD	EXPRESS	IMPRESS
.4993	.4451	.0178	.0235	.1368	.2505	.4694
.0001	.0001	.8837	.8478	.2586	.0378	.0001

TABLE 17

CORRELATION ANALYSIS:
"ADOPT" VS. 4 SATISFACTION CATEGORIES
(PEARSON CORRELATION COEFFICIENT / PROB)

OVER	REACT	FELT	SATISFY
.3761	.3849	.3124	.4089
.0012	.0008	.0090	.0005

Summary

This chapter presented the demographic breakdown of the survey population, the means and standard deviations of the responses, and the Cronbach's alphas establishing the reliability of the survey. Also, correlation analysis tables were presented. Chapter V will address these results in terms of conclusions drawn.

V. Conclusions and Recommendations

Introduction

This chapter discusses the conclusions that have been drawn from this research, based on the results displayed in Chapter IV. The means are used to establish the adoption and effectiveness of e-mail and the correlation coefficients are used to address the research objective presented in Chapter I. In addition, the comments provided by respondents to the survey are summarized. A recommendation for further research in this area is also presented.

Conclusions

Means. Of the adoption variables (Table 10), only 11 out of 36 yielded mean responses slightly on the lower side, below four, of the scale. There were no means on the low side for RELATIVE ADVANTAGE. The closest, RA7, dealt with gaining greater control over one's work by using e-mail. All means within this area indicate an overall perception by the population that e-mail is an advantage to them.

Within the category VOLUNTARINESS the mean of VOL1 was significantly on the low side of the scale. This question dealt with the boss' expectations of e-mail use, where as

VOL3, the next lowest mean in the group, dealt with the perception of the boss requiring e-mail to be used. VOL2 and VOL4 substantiate the perception that the use of electronic mail is seen as a voluntary exercise.

The COMPATIBILITY category yielded means all above four, with COM1 as the lowest. This question asked if e-mail was compatible with all aspects of the individual's work. The use of the word "all" could be responsible for this lower mean as the other three COM questions produced high means.

COMPLEXITY was a mix of high and low means. PLEX1, PLEX3, and PLEX4 showed strong agreement with the ideas that e-mail is cumbersome to use, often frustrating, and difficult to get it to do what the user wants. However, PLEX2's mean indicates that it does not require a lot of mental effort. PLEX5 and PLEX6 reinforce PLEX2 with means indicating e-mail ease, both in learning and use. So while it is awkward and frustrating, it isn't perceived as very hard to use.

The variables that make up OBSERVABILITY all showed means on the higher side of the scale. This is an indication that respondents perceive widespread use

of electronic mail throughout the School of Systems and Logistics.

AVAILABILITY (Trialibility) had only one of its four variables indicate a high mean. AVAIL1, the opportunity to try e-mail, recorded the highest mean on this portion of the survey. AVAIL2 through AVAIL4, which dealt with trying it out before actually using it, all yielded low means. This would suggest the desire to experiment with electronic mail for a period prior to being actually on line.

The final adoption factor, IMAGE, had all of its four factors produce significantly low means. This supports the conclusion that electronic mail is not perceived to enhance image within the LS faculty or staff. Individuals are not perceived to gain in status by using e-mail.

Overall, the means indicate the perceived adoption of electronic mail by the LS faculty and staff. While AVAILABILITY and IMAGE registered low means, key factors, such as RELATIVE ADVANTAGE, VOLUNTARINESS, COMPATIBILITY, and OBSERVABILITY, all yielded high means. It isn't seen as a status symbol, but is perceived as a benefit to one's work and widely used by the organization. E-mail is also perceived as frustrating and there is a perceived need for

more learning prior to use. These issues are better addressed by responses to the satisfaction with the system section and the comments section of the survey.

The responses to questions in Section III (Table 11) of the survey were split more decisively than in Section II. Of the fourteen variables, eight produced means on the lower side of the scale. Respondents, on the average, felt that the system they used for electronic mail was more boring than stimulating; used more unfriendly language than courteous; was hard to learn; impersonal; and frustrating to use. They also leaned toward the "Always" side of the scale in feeling distracted by the system's mechanics and constrained in the types of contributions they could make with e-mail. In addition, the mean indicates an inability to get an impression of personal contact from e-mail use.

From this preliminary means analysis, it can be concluded that electronic mail has been adopted into the School of Systems and Logistics. However, the satisfaction with the current electronic mail systems is still quite split. The next two sections discuss the correlation analysis results and respondents' comments. These shed some light on the satisfaction area.

Correlation Coefficients. Tables 14 through 17 show the results obtained by the various correlation analyses, performed. Correlation analysis between the 7 adoption categories and the 14 satisfaction variables (Table 14) indicated that RELATIVE ADVANTAGE (RA), COMPATIBILITY (COM), COMPLEXITY (PLEX), OBSERVABILITY (SEE), and TRIALIBILITY (AVAILABILITY) correlated with a majority of the satisfaction variables, at the .05 significance level. COMPLEXITY yielded very strong negative correlation coefficients with all but two of the satisfaction variables, EXPRESS and IMPRESS.

The same conclusions can be drawn by looking at Table 15. The 7 adoption categories versus the 4 satisfaction categories analysis resulted in the same 5 adoption categories yielding high correlation coefficients. Again, COMPLEXITY produced distinct, negative correlation coefficients. These five areas would seem to be the adoption areas influencing user satisfaction with e-mail the most.

Taking the adoption variables, as a whole, versus the 14 satisfaction variables (Table 16), 5 significant correlations resulted. The overall impression of the

system; its ability to stimulate the user; its impression of saving time; its impression of being productive; and its ability to give an impression of personal contact all yielded significant correlation coefficients. These five areas would seem to be the influencing areas for electronic mail adoption.

The combined variables correlation analysis (Table 17) yielded significant coefficients, the highest being the ADOPT versus SATISFY. This final coefficient does suggest that there is a connection between innovation adoption and user satisfaction with an electronic mail system.

The purpose of this research was to investigate the possible relationship between adopting an information technology innovation and the effectiveness of that innovation. Significant correlation coefficients have been shown that suggest a relationship does exist between certain innovation adoption factors and certain system satisfaction variables used as surrogate measures of effectiveness.

Respondents' Comments

As an addition to the survey's two main sections, a comments section was provided to allow respondents the opportunity to highlight any concerns not covered by the

adoption or the satisfaction sections. Over half of those who responded made comments. Comments received were grouped into similar areas and are summarized briefly within this section.

Comments ranged from "I like it, but I'm not connected," to "I have no use for e-mail or computers--Can you get this thing off my desk!!." Comments were equally split between liking e-mail and hating it. Many who liked it had ideas for improving it, though.

These ideas included making e-mail use mandatory throughout the School of Systems and Logistics; cutting down the amount of "junk"; and adding more training for users. The need for good documentation, such as a clear user's manual, was expressed several times.

Those who reported dislike for electronic mail had some constructive ideas for its improvement, also. One major complaint/suggestion dealt with the number of key strokes needed to operate the Q-Office system--"Weak menus deter use and fewer key strokes are needed!!" Remarks were evenly divided between positive and negative comments. The comments reinforce the idea that e-mail has become a part of AFIT/LS and the faculty/staff are interacting with it.

Recommendation for Further Research

As stated in Chapter II, actual usage data is another means of measuring system effectiveness. This is an area that could be researched further. A research project totally devoted to establishing e-mail effectiveness at AFIT would certainly require this data. In addition, it may provide further evidence of a relationship between innovation adoption and innovation effectiveness.

Summary

As budgets shrink, organizations, such as AFIT, must ensure that the equipment they possess is being used to its fullest extent. An e-mail system cannot function to its fullest potential if it is not used. Knowing what areas cause an organization to adopt an innovation, and how those areas relate to the users' satisfaction with that innovation can signal the direction for improvements to that innovation. This can result, ultimately, in better use of the innovation in the long run.

Appendix A: Survey Instrument

This is the survey instrument that was sent to the entire LS faculty and staff. A total of 150 surveys were sent out.

Section I of the survey consists of 9 questions designed to collect background demographic type information. Section II is the innovation adoption measurement instrument developed by Moore and Benbasat. Section III consists of the 14 system satisfaction questions from the Hiltz, Kerr, and Johnson instrument. The last section allowed respondents the opportunity to make their own comments concerning e-mail at AFIT.

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OH 45433-6583

REPLY TO ATTN OF: LS (Captain White, 255-8989)

5 JUL 1991

SUBJECT: Electronic Mail Questionnaire

TO:

1. Please take the time to complete the attached questionnaire and return it in the attached envelope by 12 July 1991.

2. The purpose of this questionnaire is to gather information about electronic mail and its use in the School of Systems and Logistics. The data gathered will become part of an AFIT research project and may help to identify strengths, weaknesses, and possible improvements to our present systems. Your responses will be kept completely confidential and will be used only in combination with those of other participants.

3. Your participation is completely voluntary, but we would appreciate your help. For further information, please contact Major Roger Koble at 255-4845.

PAUL T. WELCH, Colonel, USAF
Acting Dean
School of Systems and Logistics

3 Atch
1. Questionnaire
2. AFIT Form 11C
3. Return Envelope

General Instructions

1. Please answer each question as best as you can and select only one answer to each question. If for any reason you don't understand a question or don't want to answer, just skip it and go to the next one.

2. Responses will be machine scored so please mark your answers on the answer sheet provided. The usual instructions apply -- No. 2 pencil, blacken appropriate circle, erase any stray marks, don't fold the answer sheet, etc. Some questions may also require a written response, in addition to an answer sheet response.

3. The last section will give you the opportunity to speak out on anything we may have missed or elaborate on any points you wish to make. Also feel free to use the comments section to give feedback on this survey.

4. When you have completed it, please put the questionnaire and answer sheet in the envelope provided.

What is your e-mail user ID login (ie DWHITE)? _____

One issue this study is investigating is the relationship between attitudes and actual use of electronic mail. Since frequency data are available by user ID, this information will permit a more complete understanding of electronic mail use by AFIT/LS faculty and staff.

If you are not comfortable giving your user ID, feel free to leave it blank, but we ask that you please complete the questionnaire.

Thank you for participating.

I. Background

This section asks for some background information. These items will provide overall demographic information about the AFIT/LS faculty and staff.

1. In which branch do you currently serve?

    1. Air Force
    2. Army
    3. Navy
    4. Marines
    5. Coast Guard
    6. Not applicable, civilian

2. What is your designation and grade?

    1. Civilian, grade:_____(ie GS-07)
    2. Enlisted, grade:_____(ie E-5)
    3. Officer, grade:_____(ie O-3)

3. What is your gender?

    1. Female
    2. Male

4. What is your age?

    1. Less than 20
    2. 21 - 30
    3. 31 - 40
    4. 41 - 50
    5. 51 - 60
    6. Over 60

5. What is your highest level of education?

    1. Less than a high school diploma
    2. High school or graduate equivalent diploma
    3. Some college courses but no college degree
    4. Associate's degree or equivalent
    5. Bachelor's degree or equivalent
    6. Master's degree
    7. Graduate work beyond Master's degree (doctoral candidate, dissertation not complete)
    8. Doctoral degree (Ph.D, J.D., D.B.A., or equivalent)

6. What is your academic rank?

   1. Instructor
   2. Assistant professor
   3. Associate professor
   4. Professor
   5. Not applicable

7. In which programs do you teach?

   1. PCE only
   2. Mostly PCE, but some graduate
   3. About equal time in PCE and graduate
   4. Mostly graduate, but some PCE
   5. Graduate only
   6. Not applicable

8. How many years have you served on the AFIT faculty/staff (i.e., total years to include any previous military assignments to the AFIT faculty/staff)?

   1. Less than 01
   2. 01 - 02
   3. 02 - 04
   4. 04 - 05
   5. 05 - 10
   6. 10 - 15
   7. 15 - 20
   8. Over 20

9. What system do you primarily use for electronic mail?

   1. Blackbird (ssc)
   2. Cluster (isc or csc)
   3. Galaxy (lcc)
   4. Phantom (q-office)
   5. Other _____
   6. Do not use electronic mail

II. Adoption of Electronic Mail

This section asks for your opinions about electronic mail.

For each item, use the following scale to rate your level of agreement/disagreement.

1 ------ 2 ------ 3 ------ 4 ------ 5 ------ 6 ------ 7

Strongly Disagree		Neither Agree nor Disagree		Strongly Agree

Relative Advantage: the degree to which you perceive electronic mail as being better than its alternatives.

10. Using e-mail enables me to accomplish tasks more quickly.

11. Using e-mail improves the quality of my work.

12. Using e-mail makes it easier to do my job.

13. Using e-mail improves my job performance.

14. Overall, I find using e-mail to be advantageous in my job.

15. Using e-mail enhances my effectiveness on the job.

16. Using e-mail gives me greater control over my work.

17. Using e-mail increases my productivity.

Voluntariness: the degree to which use of electronic mail is perceived as being voluntary, or of free will.

18. My superiors expect me to use e-mail.

19. My use of e-mail is voluntary (as opposed to required by my superiors or job description).

20. My boss does not require me to use e-mail.

21. Although it might be helpful, using e-mail is certainly not compulsory in my job.

For each item, use the following scale to rate your level of agreement/disagreement.

1 ------ 2 ------ 3 ------ 4 ------ 5 ------ 6 ------ 7

Strongly Disagree	Neither Agree nor Disagree	Strongly Agree

Compatibility: the degree to which electronic mail is perceived as being consistent with the existing values, needs, and past experiences.

22. Using e-mail is compatible with all aspects of my work.

23. Using e-mail is completely compatible with my current situation.

24. I think using e-mail fits well with the way I like to work.

25. Using e-mail fits into my work style.

Complexity: the degree to which electronic mail is perceived as being easy/difficult to use.

26. I believe that e-mail is cumbersome to use.

27. My using e-mail requires a lot of mental effort.

28. Using e-mail is often frustrating.

29. I believe that it is easy to get e-mail to do what I want it to do.

30. Overall, I believe that e-mail is easy to use.

31. Learning to use e-mail was easy for me.

Observability: the degree to which the results of using electronic mail are observable to others.

32. I have seen what others do using e-mail.

33. I have seen e-mail in use outside my organization.

34. E-mail use is not very visible in my organization.

For each item, use the following scale to rate your level of agreement/disagreement.

1 ------ 2 ------ 3 ------ 4 ------ 5 ------ 6 ------ 7

Strongly Disagree	Neither Agree nor Disagree	Strongly Agree

35. It is easy for me to observe others using e-mail in my organization.

36. I have had plenty of opportunity to see e-mail being used.

37. I have not seen many others using e-mail in my organization.

Availability: the degree to which electronic mail may be experimented with on a limited basis.

38. I've had a great deal of opportunity to try e-mail.

39. Before deciding whether to use e-mail, I was able to properly try it out.

40. I was permitted to use e-mail on a trial basis long enough to see what it could do.

41. I am able to experiment with e-mail as necessary.

Image: the degree to which use of electronic mail is perceived to enhance image or status.

42. Using e-mail improves my image within the organization.

43. People in my organization who use e-mail have more prestige than those who do not.

44. People in my organization who use e-mail have a high profile.

45. Using e-mail is a status symbol in my organization.

III. Satisfaction with Electronic Mail

This section asks about your satisfaction/ dissatisfaction with the electronic mail system you use.

For each item, use the scale given to rate your opinion.

46. Overall, the system is...

1	2	3	4	5	6	7
Extremely Good			Neutral			Extremely Bad

47. I find using the system to be...

1	2	3	4	5	6	7
Stimulating			Neutral			Boring

48. I find the language of the system...

1	2	3	4	5	6	7
Understandable			Neutral			Confusing

49. I find the language of the system...

1	2	3	4	5	6	7
Courteous			Neutral			Unfriendly

Please indicate your reactions to using this system:

50.

1	2	3	4	5	6	7
Hard to learn			Neutral			Easy to learn

51.

1	2	3	4	5	6	7
Impersonal			Neutral			Friendly

52.

1	2	3	4	5	6	7
Frustrating			Neutral			Not frustrating

53.

1	2	3	4	5	6	7
Time wasting			Neutral			Time saving

54.

1	2	3	4	5	6	7
Unproductive			Neutral			Productive

For each item, use the following scale to rate your opinion.

1 ------ 2 ------ 3 ------ 4 ------ 5 ------ 6 ------ 7
Always Sometimes Never

How frequently have you felt...

55. ...distracted by the mechanics of the system?

56. ...constrained in the types of contributions you could make?

57. ...overloaded with information?

58. ...able to express your views?

59. ...able to get an impression of personal contact?

IV. Comments

Please use this section to make any comments or suggestions that may benefit the faculty or the Institute. Any comments you make, like the rest of this questionnaire, will be strictly anonymous.

Thank you for your input and assistance.

Appendix B: Raw Data

This is the raw data for the 80 valid cases used in this research. Data format is as follows:

1. Each case is displayed on two lines.

2. The first line contains a four digit identification number assigned for tracking purposes.

3. The second line contains the responses in the numerical order of each question (that is, column 1 = the response to question 1, column 2 = the response to question 2, etc.).

4. If there was no response to a question, the field contains a period.

0001
131371234555555557111777743334455344171177774445444435664l4
0002
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0003
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13. ABSTRACT (Maximum 200 words)

This research investigated the relationship between the adoption and effectiveness of electronic mail at the Air Force Institute of Technology's School of Systems and Logistics (LS). In this research, theories concerning innovation adoption and measurement of system effectiveness are discussed. Survey instruments from both areas were selected, tested, and used to collect data from the LS faculty and staff. Correlation analysis was performed using the data collected. Findings indicate a correlation does exist between the adoption of electronic mail and the effectiveness surrogate measurement, user satisfaction. There was a significantly strong negative correlation between electronic mail complexity and user satisfaction.

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