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MEASURING USER SATISFACTION OF THE ELECTRONIC MAIL SYSTEM AT AIR FORCE MATERIEL COMMAND HEADQUARTERS AS AN INDICATOR OF THE SYSTEM'S EFFECTIVENESS

THESIS

Randall R. Bradford, Captain, USAF

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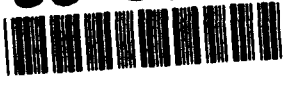

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MEASURING USER SATISFACTION OF THE ELECTRONIC MAIL SYSTEM AT AIR FORCE MATERIEL COMMAND HEADQUARTERS AS AN INDICATOR OF THE SYSTEM'S EFFECTIVENESS

THESIS

Presented to the Faculty of the School of Logistics and
Acquisition Management
Air Education and Training Command
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Information Resource Management

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December 1993

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Preface

The purpose of this study was to provide the Air Force Materiel Command with an objective measurement of system effectiveness for its electronic mail system. This objective measurement was needed to ensure that the electronic mail system is meeting the users' needs.

This research used a survey to gather data on user satisfaction. The statistical analysis of the data gathered by administering the survey enabled me to draw conclusions about the effectiveness of the electronic mail system and offer recommendations for improving the system's effectiveness.

I received an enormous amount of help from several individuals throughout this research process. I am sincerely grateful to my faculty advisors, Lt Col Phillip Miller and Captain Marsha Kwolek, for their suggestions, guidance, and timely assistance. I am also grateful to Mr. Kevin Kampman and Major Maureen Casey of the Air Force Materiel Command for their help and information. I also thank Dr. Guy Shane for his assistance in the data analysis. Finally, I thank my wife, Szana, and my children, Ben, Brittany, and Amanda for their understanding and patience.

Randall R. Bradford

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Abstract

The purpose of this study was to evaluate the effectiveness of the electronic mail system installed at the Air Force Materiel Command Headquarters. User satisfaction was measured as an indicator of the system's effectiveness.

In order to provide an objective measurement of system effectiveness, the following research questions were addressed: (1) What is system effectiveness in relation to this particular electronic mail system, and how should it be measured? (2) What measurement instruments can be adapted, modified, or created to measure effectiveness as it is defined for this problem? (3) If a measurement instrument is administered, what do the results of the measurement indicate, and how do the results compare to the Office Automation staff's perceptions?

User satisfaction was determined to be the best possible measure of system effectiveness and it was measured by administering a user satisfaction survey. The data gathered from this survey was analyzed and that analysis provided the basis for concluding that the electronic mail system was meeting the users' needs, but that the system effectiveness could be improved by providing training. Recommendations were offered to the Office Automation staff and suggestions for further research were also given.

MEASURING USER SATISFACTION OF THE ELECTRONIC MAIL SYSTEM AT AIR FORCE MATERIEL COMMAND HEADQUARTERS AS AN INDICATOR OF THE SYSTEM'S EFFECTIVENESS

I. Introduction

General Issue

The Air Force Materiel Command (AFMC) has installed a local area network designed to connect 3,000 users throughout its headquarters at Wright-Patterson Air Force Base. One of the principal goals of the network is to provide users with a powerful electronic mail system capable of meeting the users' communications needs (Strong, 1993).

The AFMC initially allocated $9 million to fund the network project which began in May, 1991 (Strong, 1993). Currently, 2,600 users are connected to the network through a series of 35 file servers. The network is managed by AFMC's Office Automation staff with TRW, Inc. acting as the primary contractor.

This local area network and its electronic mail system represent a major investment in an information system which is considered to be the model for the Air Force. For example, this system has already been installed at Air Mobility Command Headquarters at Scott Air Force Base and is

being looked at by other Air Force organizations with great interest (Strong, 1993).

Specific Problem

Technically, there is no doubt that the system functions. The network and the electronic mail system are fully operational and the Office Automation staff report that all system design goals have been achieved (Strong, 1993).

The problem, however, is that the Office Automation staff needs an objective measurement of system effectiveness to ensure that the system is meeting the users' needs. While it is true that the system is fully operational, it is not necessarily true that the users are completely satisfied with the system and are using the system to its fullest capability.

Definition of Research

This research will evaluate the existing measurements of effectiveness for information systems which might be used by AFMC's Office Automation staff. This evaluation will begin with an extensive literature review of the current methodologies relating to information systems, local area networks, office automation projects, and electronic mail systems.

All available methodologies will be evaluated in order to determine if a measurement instrument already exists which can be applied, with or without modifications, to the

specific needs of AFMC. This research will evaluate the electronic mail system at AFMC within the context of an office automation system.

Research Questions

In order to provide an objective measurement of system effectiveness for AFMC's electronic mail system, the following research questions must be answered.

1. What is system effectiveness in relation to this particular electronic mail system, and how should it be measured?
2. What measurement instruments can be adapted, modified, or created to measure effectiveness as it is defined for this problem?
3. If a measurement instrument is administered, what do the results of the measurement indicate, and how do the results compare to the Office Automation staff's perceptions?

Scope

The results of this research are not generalizable to areas outside of the Air Force Materiel Command Headquarters. This research is designed to measure the effectiveness of this particular electronic mail system and is not concerned with other types of electronic mail systems.

Although the measurement results are limited in scope to AFMC, the measurement instrument might be useful to other

organizations which use a similar electronic mail system if the instrument is properly validated.

Thesis Organization

Chapter II reviews the literature relating to this topic and addresses the issues raised in the first two research questions. Chapter III explains the methodology used to answer the third research question and describes the population and sample of interest. Chapter III also describes the survey instrument, the data collection plan, and the data analysis plan. Chapter IV analyzes the findings of the survey. Finally, Chapter V lists the conclusions and recommendations for further research.

II. Literature Review

Introduction

This chapter defines electronic mail and describes the features of the BeyondMail system which is used at AFMC. The remainder of this chapter is devoted to answering the first two research questions of this study through a review of the literature related to computer-based information systems and electronic mail.

Electronic Mail

The essential features of communication are the message, the sender, the receiver, and the medium (Stamper, 1991:14). Electronic mail is a computer-mediated form of communication capable of delivering messages from a sender to a receiver almost instantaneously without the use of paper, envelopes, or physical delivery (White, 1991:2). As such, electronic mail differs from regular mail primarily in the medium used (Trudell, 1984:15). Within an organization, electronic mail is typically established through a computer network.

There are many network applications. One of the most important applications is office automation which uses electronic mail as a means of communication. The use of microcomputers combined with electronic mail and document exchange systems has significantly changed the way offices

function (Stamper, 1991:269). The BeyondMail system installed at AFMC is the key part of the organization's office automation efforts and offers a wide variety of capabilities.

Features of BeyondMail Version 1.1

BeyondMail is the software used for electronic mail at AFMC. BeyondMail is definitely a state-of-the-art electronic mail program. Some of the most significant features include messaging, editing, handling options, and customizing forms features which provide the user with a wide variety of tools for communication needs and office automation services (BeyondMail Specification Sheet, 1992).

Messaging and Editing. BeyondMail allows the user to send, receive, read, reply to, and forward messages. The software also allows the user to convert messages to drafts for editing. Once a message is received, the user can convert the message to a draft, make changes on the screen, and reply directly back to the sender. Editing features include the ability to cut, copy, paste, move, and clear information (BeyondMail Specification Sheet, 1992).

Handling Options. BeyondMail software provides an encryption capability which is of significant interest to many users who send and receive sensitive information. The software also allows the sender to set mail priorities such as urgent, low, or regular. Another interesting feature is the ability to request a return receipt. This feature could

be useful to a user who needs to ensure that a message is received (BeyondMail Specification Sheet, 1992).

Forms. One feature of BeyondMail software which could be quite useful in an organization's efforts to reduce paper usage is the ability to create electronic versions of business forms. The software will allow the user to customize forms with the BeyondMail Forms Designer (BeyondMail Specification Sheet, 1992).

Potential Problem

Even though BeyondMail is a technologically advanced electronic mail system, users who are dissatisfied with an electronic mail system will not use the system to its fullest capability (Ives and others, 1983:786). The specific research problem stated in Chapter I identified this problem and called for an objective measurement of system effectiveness to ensure that the system is actually meeting the users' needs.

Answering the First Two Research Questions

The first two research questions can be answered through a review of previous research in this area. There has been a great deal of research designed to provide an objective measurement of system effectiveness in relation to information systems, office automation systems, and electronic mail.

Research Question 1. The first research question asks what system effectiveness is in relation to this particular

electronic mail system and how it should be measured. The answer obtained from the following literature review is that user satisfaction is an acceptable surrogate measurement of system effectiveness and it should be measured subjectively.

Difficulties in Measurement. To begin, it is generally not possible to directly measure the impact of an information system in terms of productivity benefits or other economic cost and benefits measures (Raymond, 1987:173; Ives and Others, 1983:785). In fact, this author could not find a single research source which directly measured the impact of an information system in economic terms.

The difficulty in measuring the economic cost and benefits of a system or its effectiveness is largely due to the nature of information systems themselves and how they are used within organizations. For example, intangible costs and benefits of information systems are difficult to recognize and express in monetary terms. Also, some systems are used in an unstructured environment for a wide variety of purposes, thus making the resulting benefits of the system practically impossible to assess. Finally, information regarding information system success may not be recorded by an organization even when it would be determinable, thereby making the information unavailable for research studies (Ives, and others, 1983:786).

For these reasons, researchers have attempted to find acceptable measures of system success which would provide an

organization with a viable substitute for economic or productivity measures. Throughout the literature, user satisfaction has been widely accepted as a surrogate measure for system success (Bailey and Pearson, 1983:530; Raymond, 1987:173; Ives and others, 1983:785; Tan and Lo, 1990:203; Hiltz and Johnson, 1990:739).

User Satisfaction Defined. User satisfaction is defined as the "extent to which users believe the information system available to them meets their information requirements" (Ives and others, 1983:785). As such, user satisfaction is a subjective measure of system success. In partial answer to the first research question, therefore, user satisfaction must be measured subjectively by asking the users what their satisfaction level is.

Basis for Accepting User Satisfaction. The research in this area began with the work of Cyert and March, who developed the original concept of user information satisfaction in their book entitled, A Behavioral Theory of the Firm, published in 1963. In their empirical research, Cyert and March found that when an information system successfully meets the needs of the users, the users' satisfaction with that system is reinforced. Therefore, the users will be more likely to use the system in the future and the satisfaction with the system will continue to be reinforced (Cyert and March, 1963:124-127). According to Bailey and Pearson, another early researcher, Evans, found that users will cease using a system completely and search

for alternative sources of information when the system fails to meet the users' needs (Bailey and Pearson, 1983:530).

The concept of user satisfaction was further developed by the empirical research of two other studies. Swanson conducted research which found a high correlation between a user's satisfaction with an information system and his or her utilization of its outputs (Swanson, 1974:184-186). This research further developed the connection between user satisfaction and system success.

The other study which developed this connection was accomplished by Powers and Dickson. Powers and Dickson studied 10 organizations in a field study which evaluated several criteria of information system success. Of all those criteria evaluated, Powers and Dickson found user satisfaction to be the most critical criteria for information system success. This conclusion was based on the empirical results of their research and their conclusion that, despite all other computer operation considerations, if an information system does not satisfy the user it is intended to serve, the system is a failure (Powers and Dickson, 1973:153).

In the case of AFMC, user satisfaction is the specific determinant of system success which the Office Automation staff is interested in measuring (Kampman, 1993). Therefore, based upon the work of previous researchers, user satisfaction is accepted as the measure of system effectiveness at AFMC.

Research Question 2. The second research question asks what measurement instrument can be adapted, modified, or created to measure effectiveness as it is defined for this problem. Based upon a review of prior research, two previously validated instruments can be adapted to measure user satisfaction at AFMC.

Each instrument is based upon extensive research and has been tested and applied in many settings. The first instrument, developed by Tan and Lo, measures user satisfaction in the context of an office automation system. The second instrument, developed by Hiltz and Johnson, measures user satisfaction in the context of a computer-mediated communication system. Each instrument offers a unique perspective valuable to this research.

These two instruments build upon the work of Bailey and Pearson. In 1983, Bailey and Pearson evaluated all earlier attempts to measure user satisfaction in an effort to develop an effective measurement instrument. Bailey and Pearson did not find an existing instrument which provided such a measure. Since the work of Bailey and Pearson in 1983, this author has not found any instruments in the literature other than the ones presented here which build upon Bailey and Pearson's work.

Tan and Lo: User Satisfaction and Office Automation. Tan and Lo adapted and validated Bailey and Pearson's research instrument to measure user satisfaction in the context of an office automation system with

electronic mail being a primary application of office automation systems (Tan and Lo, 1990:203). This is applicable to AFMC in that BeyondMail is the primary application of the office automation system.

Bailey and Pearson developed a research instrument consisting of 39 factors designed to measure user satisfaction with computer systems (Bailey and Pearson, 1983:530). Tan and Lo selected 33 of the original 39 factors for their study of office automation (Tan and Lo, 1990:204). Six of the original 39 factors were removed from the research instrument because those questions applied to broader applications in management information systems and did not directly apply to office automation. For example, questions concerned with *items* such as charge-back for service and vendor support were not considered relevant to the study of office automation specifically.

Tan and Lo's research instrument can be further refined to measure user satisfaction with the BeyondMail system at AFMC by eliminating factors which are not applicable to AFMC and the BeyondMail system. Also, the wording of the questions can be adapted to the system being studied.

Hiltz and Johnson: User Satisfaction and Computer-Mediated Communication Systems. Hiltz and Johnson accepted the previous arguments that user satisfaction is an acceptable measure of system effectiveness but concentrated on electronic mail as a computer-mediated communication system (CMCS). Hiltz and Johnson defined electronic mail as

"message systems that deliver discrete text communications from a sender to one or more recipients via computer networks" (Hiltz and Johnson, 1990:740).

Hiltz and Johnson used the systems contingency approach which views the CMCS as a "human-computer system" (Hiltz and Johnson, 1990:739). This system is composed of the users, the CMCS, and the hardware through which the users access the CMCS. Hiltz and Johnson's research was built upon the work of previous studies of CMCS (Hiltz and Johnson, 1990:739).

Hiltz and Johnson developed a research instrument containing 14 questions designed to measure user satisfaction with a CMCS. The 14 questions measure an information system in the more basic context of an electronic mail system. While the BeyondMail system at AFMC is a significant part of the office automation project, it can also be studied in the context of simply being an electronic mail system. The instrument developed by Tan and Lo will provide a somewhat broader view of the BeyondMail system and Hiltz and Johnson's instrument will provide a more basic view. Combined, these instruments should provide a useful measure of the BeyondMail system at AFMC.

Conclusions

The purpose of this research is to provide the Air Force Materiel Command with an objective measurement of system effectiveness to ensure that the system is meeting

the users' needs. This literature review has provided an acceptable measure of system effectiveness and previously validated research instruments which can be used to measure that effectiveness. Chapter III will provide a methodology for applying these research instruments in a field study at the Air Force Materiel Command in order to answer the third, and final research question.

III. Methodology

Introduction

This study addresses three research questions as stated in Chapter I. The research questions ask:

1. What is system effectiveness in relation to this particular electronic mail system, and how should it be measured?
2. What measurement instruments can be adapted, modified, or created to measure effectiveness as it is defined for this problem?
3. If a measurement instrument is administered, what do the results of the measurement indicate, and how do the results compare to the Office Automation staff's perceptions?

The literature review answers the first two research questions. This chapter provides the methodology used to answer the third research question by describing the research design and the research instrument used to measure user satisfaction as defined in Chapter II. Furthermore, validation of the methodology is discussed, followed by a description of the data collection plan and the data analysis plan.

Research Design

This research is designed to measure user satisfaction, which is the user's subjective measurement of system success

(Tan and Lo, 1990:204). Therefore, a survey is appropriate since the respondents must provide a personal assessment of that satisfaction.

A mail survey is preferred over personal and telephone interviews for two reasons. First, a mail survey is perceived as more anonymous (Emory and Cooper, 1991:38). Bailey and Pearson state that the "questionnaire must be used in an atmosphere of user anonymity" (Bailey and Pearson, 1983:538). Secondly, due to the large number of surveys, a mail survey is the most practical alternative.

Research Instrument

This section describes the contents of the questionnaire and the rating scale for the questions. The survey pre-test is reviewed and the method for selecting questions for the final survey and assigning specific descriptions to those questions is examined.

Contents. The questionnaire contains nine questions in the first section relating to demographic information. Section II of the survey contains 13 questions from Tan and Lo's research which measure user satisfaction in the context of an office automation system. Section III contains 13 questions from Hiltz and Johnson's research which measure user satisfaction of electronic mail as a computer-mediated communication system. Finally, Section IV provides the respondent with an opportunity to make comments or suggestions.

Throughout this report, the term section refers to Section II and Section III of the questionnaire which corresponds to Tan and Lo's research instrument and to Hiltz and Johnson's research instrument, respectively. A copy of the questionnaire is attached in Appendix A.

Rating Scale. Questions in Section II and Section III are rated on a Likert scale with values ranging from 1 to 7. This scale provides a differentiation between extreme values such as those used in both sections of the questionnaire. The descriptions of the scales, however, differ between Section II and Section III. All of the questions in Section II are rated from extremely dissatisfied to extremely satisfied while the questions in Section III use a variety of descriptive terms.

Pre-Test. A pre-test of the questionnaire will be administered to a small sample of approximately 10 users purposefully chosen for the pre-test based upon the user's expertise and knowledge of the system. The results of this pre-test will be analyzed for areas of improvement. The respondents will be asked to evaluate the construct of each question and provide feedback on how well the survey instrument measures user satisfaction.

Question Selection. According to Bailey and Pearson, when using the instrument in specific applications, "it is reasonable to remove irrelevant factors and redefine the factors in situation specific terms" (Bailey and Pearson, 1983:538). This should also apply to Hiltz and Johnson's

instrument as well. Therefore, the specific questions included in the final survey were determined by analyzing the results of the pre-test and by consulting with key personnel within the Office Automation staff.

Final Question Description. Since the original questions used by both Tan and Lo's research and Hiltz and Johnson's research have broad and generalized meanings, the particular questions used in the final survey were made clearer by using a vocabulary specific to AFMC.

Validation

This section examines the reliability and internal validity of both Tan and Lo's and Hiltz and Johnson's measurement instruments. External validity is not addressed due to the fact that this research is not generalizable to areas outside of AFMC.

Tan and Lo: Section II. Tan and Lo's research is based upon the original work of Bailey and Pearson and has been extensively validated. Internal validity is discussed in terms of content and construct validity.

Content Validity. Content validity refers to the extent to which an instrument provides adequate coverage of the topic under study (Emory and Cooper, 1991:180). Content validity is basically a matter of judgment. Given the rigorous manner in which Bailey and Pearson, Ives et al. and Raymond developed a comprehensive list of scales, along with the results of their in-depth analysis, content validity of

Tan and Lo's instrument appears to be more than adequate (Tan and Lo, 1990:205).

Construct Validity. Construct validity relates the measurement instrument to the theory of which it is a part (Emory and Cooper, 1991:182). One method of construct validation examines the correlations between item scores and total scores. In the study completed by Tan and Lo, each item score was correlated to the total score:

> The correlation coefficient for the measurement instrument ranged from 0.39 to 0.79 with only one correlation coefficient being below 0.55 (Table 1). All the correlations were significant at the 0.0001 level. If it can be assumed that the total scores do measure user satisfaction, these results could indicate support for construct validity of the measurement instrument. (Tan and Lo, 1990:205)

The other construct validation method involves factor analysis. The results of the factor analysis also support the construct validity of the instrument (Tan and Lo, 1990:205).

Reliability. Reliability refers to the stability of a measurement instrument over a variety of conditions (Tan and Lo, 1990:205). The reliability of Tan and Lo's instrument was tested using the internal consistency and split-halves methods. These methods measure how well each of the various instrument questions measures the same construct or idea. Typically, the questions on the instrument are separated into two groups and the correlations between the two groups of questions are calculated. If the correlations are high, then the

questions are said to measure the same entity (Emory and Cooper, 1991:186).

For Tan and Lo's instrument, the reliability for the internal consistency method is 0.96 and the reliability for the split-halves method is 0.94. For the purpose of research, a reliability of 0.80 or better is deemed adequate (Tan and Lo, 1990:205). Therefore, it appears that the instrument is reliable.

Hiltz and Johnson: Section III. Each of the 14 questions taken from Hiltz and Johnson's research has been used in previous research and, therefore, has received a great deal of validation and reliability testing prior to Hiltz and Johnson's efforts. Hiltz and Johnson state that each question had previously demonstrated acceptable internal validity, variability, and reliability (Hiltz and Johnson, 1990:749).

Data Collection

This section outlines the method of collecting data. To begin, the population and sample size are defined. Then, the proportionate stratified sampling technique is described.

Population. The population consisted of 2,608 users who were assigned to AFMC and worked in the headquarters building. A list of these users was obtained from the network manager and the survey participants were selected from this list. There was a small number of users who

belonged to other organizations outside of AFMC, and these users were excluded from this study.

Each Office Automation staff member who was directly responsible for the development and implementation of the BeyondMail system received a questionnaire. This census was separate from the user survey and its results allowed a comparison of the staff's perceptions to the users' responses.

Sample Size. In order to obtain a 95 percent confidence interval, the minimum sample size needed would be, at most, approximately 335 samples. To provide the best possible estimator of the population mean, this research used a total of 500 surveys or approximately 19 percent of the total population. The formula used to calculate this sample size is the most conservative formula found by this researcher. The formula,

$$n = \frac{NZ^2 * .25}{(d^2 * (N-1)) + (Z^2 * .25)}$$

where:

n = sample size required

N = total population size (2,608)

d = precision or confidence level desired (.05)

Z = factor for confidence level (1.96)

was originally developed by Krejcie and Morgan and referenced in the Handbook in Research and Evaluation (Isaac and Michael, 1981:192). For AFMC, the formula estimates the required sample size to be 335. Prior research at AFIT has

shown that a return rate above 60 percent for surveys conducted within military organizations is quite typical. Therefore, a sample size of 500 was the best compromise between the desire for accuracy and the desire for efficiency.

Proportionate Stratified Sampling. This study used a proportionate stratified sample. According to Emory and Cooper, stratification reduces the overall variability since the variation within each strata, combined, is typically lower than the total variation (Emory and Cooper, 1991:266). Also, stratification and proportionate sampling are almost always more efficient statistically when compared to simple random sampling (Emory and Cooper, 1991:226).

The population was divided into 19 mutually exclusive subpopulations or strata. These 19 strata correspond to the command staff offices and command directories which are connected to the network. Within each strata, a systematic sample of 19 percent of the users was taken. Once the number of users to be surveyed within a strata was determined, every *k*th element in the strata was selected beginning with a random start with an element from 1 to *k*. The starting element was selected from a random number table.

Table 1 lists the 19 command staff offices and command directories, along with their population size and sample size, used in the proportionate stratified sample. As

stated earlier, this list was taken from the electronic mail system and shows the number of active electronic mail accounts for the BeyondMail system.

TABLE 1

COMMAND STAFF OFFICES AND COMMAND DIRECTORIES WITHIN AFMC

Strata	Population	Sample Size
Office of Corporate Information	400	77
Command Chaplain	9	2
Command Historian	9	2
Office of International Affairs	13	2
Office of Intelligence	40	8
Staff Judge Advocate	35	7
Office of Public Affairs	38	7
Command Surgeon	55	11
Office of Security Police	37	7
Command Civil Engineer	179	34
Test and Operations	80	15
Personnel	208	40
Engineering and Technical Management	113	22
Financial Management and Comptroller	236	45
Logistics	435	83
Contracting	117	22
Science and Technology	115	22
Plans and Programs	225	43
Requirements	264	51
Total	2,608	500

Data Analysis

This section discusses the use of Cronbach's alpha and the statistical tests used to analyze the data. The results of this data analysis were used to answer the third research question.

Cronbach's Alpha. Cronbach's alpha is "one of the most important and pervasive statistics in research involving test construction and use" (Cortina, 1993:98). The coefficient alpha is a measure of the internal consistency and reliability of the measurement instrument. It measures the variance attributable to the individual items and relates that variance to the overall measure (Cortina, 1993:98-100).

The Statistical Analysis System (SAS) Proc Corr Alpha function was used to calculate the value of Cronbach's alpha, R^2, which is a number between 0 and 1. Specifically, the value of R^2 is the percentage of variance explained. A value close to 1 means that a large percentage of the variance is explained, whereas a value close to 0 means that a small percentage of the variance is explained.

The reliability and validity of this research instrument rests largely upon the previous work of the many authors who developed and refined the instruments from which it was formed. Cronbach's alpha does, however, provide a measure of the internal consistency and reliability of this instrument in its present, modified form.

Statistical Tests. The SAS program was used to analyze the data gathered by the survey. To begin, the Proc Univariate FREQ function was used to calculate the mean and standard deviation for each question in Section II and Section III of the instrument. The FREQ option provided the demographic data by calculating the number of respondents

belonging to each category of a demographic question (Schlotzhauer and Littell, 1991:95-99).

Once these basic tests were completed, the Proc Corr function was used to calculate the correlation coefficients for all questions. These coefficients were examined to determine which questions were highly correlated and, thereby, warranted further investigation and analysis.

Once the means and standard deviations were calculated, the Proc TTest function was used to determine if the overall mean satisfaction level for the users was different than the overall mean satisfaction level for the OA staff. The third research question asked how the OA staff's perceptions compared with those of the users. This test provided a measure of how the two groups' perceptions compare.

The Proc TTest and Proc ANOVA functions were used to analyze the demographic questions. For each demographic question, the appropriate test was performed on each question in Section II and Section III.

The Proc TTest function was used to analyze the demographic questions which contain only two possible responses. Specifically, questions 1, 6, and 7 contain two possible responses. The Proc TTest function compared the satisfaction levels (means) for the two groups responding to these questions (Schlotzhauer and Littell, 1991:224). The Proc TTest function tested the following null hypotheses for questions 1, 6, and 7:

1. There is no significant difference between the mean satisfaction level for males and the mean satisfaction level for females.

6. There is no significant difference between the mean satisfaction level of those users who have previously used other electronic mail systems and those who have not.

7. There is no significant difference between the mean satisfaction level for those who have received formal training and those who have not.

The Proc ANOVA function was used to analyze the demographic questions which contain more than two possible responses. Specifically, questions 2, 3, 4, 8, and 9 contain multiple possible responses. The Proc ANOVA function compared the satisfaction levels (means) for each of the groups responding to these questions (Schlotzhauer and Littell, 1991:227). Specifically, the Proc ANOVA function was used to test the following null hypotheses for questions 2, 3, 4, 8 and 9:

2. There is no significant difference among the mean satisfaction levels for users based upon their age.

3. There is no significant difference among the mean satisfaction levels for users based upon their education.

4. There is no significant difference among the mean satisfaction levels for users based upon how long the user has used a computer.

8. There is no significant difference among the mean satisfaction levels for users based upon how long the user has used the BeyondMail system.

9. There is no significant difference among the mean satisfaction levels for users based upon the designation of the user (civilian, enlisted, or officer).

For the Proc ANOVA tests which identified significant differences among the mean satisfaction levels, the Scheffe method of multiple comparisons was used to test all possible comparisons for significant differences. The SAS Proc ANOVA SCHEFFE function was used to perform the Scheffe comparisons.

In comparison to the Tukey and Bonferonni methods of multiple comparisons, the Scheffe method is the most appropriate method for this research for several reasons. To begin, the Scheffe method may be used when the factor level sample sizes are not equal (Neter and others, 1990:735-736). The factor level sample sizes refer to the classifications within the responses for the demographic variables. The factor level sample sizes for this research were not equal. The Tukey method, on the other hand, can only be used when the factor level sample sizes are equal (Neter and others, 1990:735-736).

Also, the Scheffe method gives all possible contrasts among factor levels (Neter and others, 1990:735-736). Furthermore, the Scheffe method is better than the Bonferonni method when the number of contrasts is larger than the number of factor levels (Neter and others, 1990:735-736). For this research, the number of contrasts was larger than the number of factor levels.

The results of the Proc Ttest and Proc ANOVA functions indicated which demographic factors provided relevant information to enhance the understanding of how those

information to enhance the understanding of how those factors relate to user satisfaction. The results of these tests were analyzed along with the comments made by the survey respondents in order to answer the third research question.

Summary

This chapter described the research design and the research instrument used to measure user satisfaction. A description of the data collection plan and the data analysis plan was also given. The information gathered by analyzing the data collected with the research instrument was used to answer the third research question.

IV. Data Description and Analysis

Introduction

This chapter describes the data collected by administering the survey instrument in accordance with the methodology provided in Chapter III. This chapter begins with a description of the pre-test results which preceded the survey. Then, the survey results are given in the form of Cronbach's alpha coefficients, demographic information, descriptive statistics, correlation coefficients, and statistical tests.

In several tables throughout this chapter, questions 10 through 35 are referred to as Q10 through Q35, respectively. For the convenience of the reader, the survey questions are reproduced here for easy reference. Questions 10 through 35 are rated on a scale from 1 to 7 with a value of 1 being negative or unfavorable and a value of 7 being positive or favorable. A value of 4 represents a neutral position. For a complete description of the scales, see the complete copy of the survey in Appendix A.

Section I. Background

1. What is your gender?
    1. Male
    2. Female

2. What is your age?
   1. Less than 25
   2. 26-32
   3. 33-39
   4. 40-46
   5. 47-53
   6. 54-60
   7. Over 60

3. What is your highest level of education?
   1. Less than a high school diploma
   2. High school diploma or equivalent
   3. Some college courses but no degree
   4. Associate's degree or certificate
   5. Bachelor's degree
   6. Master's degree
   7. Doctoral degree

4. How long have you used a computer?
   1. Less than 1.5 years
   2. 1.5-3
   3. 3-5
   4. 5-10
   5. 10 or more years

5. What is your office symbol?

6. Is this (BeyondMail at AFMC) the first electronic mail system you have used?
   1. Yes
   2. No

7. Have you received formal training on using the BeyondMail system?
   1. Yes
   2. No

8. How long have you been using the BeyondMail system?
   1. 0-3 months
   2. 3-6 months
   3. 6-9 months
   4. 9-12 months
   5. 12 months or more

9. What is your designation?
   1. Civilian
   2. Enlisted
   3. Officer

Section II. Satisfaction with Electronic Mail

How satisfied are you with..

10. Relevancy The degree to which BeyondMail provides the services you want or require.

11. Reliability The reliability of BeyondMail.

12. Completeness The comprehensiveness of BeyondMail's services and capabilities.

13. Volume of output The amount of information conveyed to you through BeyondMail.

14. Relationship with the Office Automation (OA) staff The interaction between you and the OA staff.

15. Technical expertise of the OA staff The computer technology skills and expertise exhibited by the OA staff in the area of technical support.

16. Understanding of systems How well you understand BeyondMail and its use.

17. Degree of training The amount and quality of instruction you received to develop your proficiency in utilizing the BeyondMail system.

18. Job effects The changes in job freedom and job performance resulting from the implementation of the BeyondMail system.

19. Security of data The safeguarding of data from misappropriation or unauthorized alteration or loss.

20. Perceived utility Your judgement about the usefulness or productivity of the BeyondMail system.

21. Convenience of access The ease or difficulty with which you utilize BeyondMail.

22. Integration of systems The ability of BeyondMail to communicate/transmit data between systems servicing different functional areas or users at other locations.

Section III. Satisfaction with Electronic Mail

23. Overall, the BeyondMail system is...
(Extremely Bad to Extremely Good)

24. I find using the BeyondMail system to be...
(Boring to Stimulating)

25. I find the language/mechanics of the BeyondMail system...
(Confusing to Understandable)

26. I find the language/mechanics of the BeyondMail system...
(Unfriendly to Friendly)

Please indicate your reactions to using BeyondMail:

27.	Hard to Learn	to	Easy to Learn
28.	Impersonal	to	Friendly
29.	Frustrating	to	Not Frustrating
30.	Time Wasting	to	Time Saving
31.	Unproductive	to	Productive

How frequently have you felt:
(Questions 32 through 35 are rated from always to never)

32. ...distracted by the mechanics of the BeyondMail system?

33. ...overloaded with information?

34. ...unable to express your views?

35. ...unable to get an impression of personal contact?

Pre-Test Results

As part of the survey development, the researcher surveyed 10 users who were familiar with the BeyondMail system. The 10 users were chosen with the help of Major Maureen Casey of the Corporate Information office. The users were reported to be familiar with the BeyondMail system in that they had been using the system since its initial implementation. In this respect, the users should have been as familiar with the system at AFMC as were any other users. The purpose of the pre-test, as mentioned in Chapter III, was to assess the construct of the questionnaire.

The pre-test participants reported a lack of understanding in relation to the wording of question 25 and question 26 and suggested that adding the word language to each question would make the questions more understandable. Based upon this input, the word language was added to question 25 and question 26.

Other than this single discrepancy, the pre-test participants reported that the questionnaire was clear, understandable, and appeared to measure user satisfaction with the BeyondMail electronic mail system as intended. These results further demonstrated the construct validity of the research instrument.

Based upon the results of the pre-test, the survey instrument was finalized and administered to 500 users and 10 Office Automation staff members at AFMC. Of those

surveyed, 260 users and 8 Office Automation staff members returned useable surveys for a response rate of 52 percent for users and 80 percent for Office Automation staff members. While the number of user surveys returned was less than the estimated sample size of 335, the confidence level associated with 269 responses is between 0.05 and 0.06, which is sufficient for this research.

Cronbach's Alphas and Construct Validity

The SAS Proc CORR ALPHA procedure was used to calculate Cronbach's alpha coefficients for the survey as a whole and for each question. The results of the first Proc CORR ALPHA procedure are given in Table 2. The coefficient for the survey as a whole was an exceptionally high 0.962413.

The Proc CORR ALPHA procedure also calculates what the overall Cronbach's alpha coefficient for the survey would be if an individual question was removed from the survey. In other words, this is what the overall value of Cronbach's alpha would have been without that particular question. This calculation is performed for each question and the coefficient appears in Table 2 to the right of each question under the heading Cronbach's Alpha. If a coefficient which appears under this heading is larger than the overall coefficient given at the top of the table, then that would indicate that the particular question might be a bad item and should, therefore, be removed from the survey (Schlotzhauer and Littell, 1991:258-261).

The alpha coefficients for Q17 and Q19 were higher than 0.962413, indicating that the overall coefficient would increase if these two questions were removed. Therefore, the Proc CORR ALPHA procedure was performed again after Q17 and Q19 were removed and the overall coefficient increased to 0.964140. The overall coefficient increased, but the increase was only marginally better. In fact, the increase was so small that Q17 and Q19 can be regarded as good questions which could provide meaningful information and should, therefore, remain as part of the survey.

The coefficients given in Table 2 under the heading Correlation With Total indicate the degree to which that particular question correlates to the overall measure. This value is inversely proportional to the value in the column labeled Cronbach's Alpha. This is due to the fact that when the question is highly correlated with the overall measure, the overall value of Cronbach's alpha would decrease if that question was removed because that particular question adds to the internal consistency of the measurement instrument rather than detracting from it.

The Cronbach's alpha coefficient of 0.962413 is a measure of the survey's internal consistency. This value indicates that 96.2413 percent of the variance found in the measurements is explained or accounted for by the instrument. Therefore, only 3.7587 percent of the variance is unexplained or unaccounted for.

TABLE 2

CRONBACH'S ALPHA COEFFICIENTS

For All Variables: 0.962413

Variable	Correlation With Total	Cronbach's Alpha
Q10	0.726432	0.960673
Q11	0.633258	0.961525
Q12	0.733520	0.960654
Q13	0.655216	0.961271
Q14	0.528811	0.962275
Q15	0.531298	0.962273
Q16	0.612784	0.961643
Q17	0.478262	0.963243
Q18	0.719111	0.960725
Q19	0.433458	0.962827
Q20	0.789469	0.960135
Q21	0.787121	0.960083
Q22	0.592484	0.962014
Q23	0.827542	0.959810
Q24	0.760724	0.960518
Q25	0.761387	0.960332
Q26	0.773632	0.960258
Q27	0.763309	0.960338
Q28	0.824436	0.959914
Q29	0.810359	0.959841
Q30	0.815357	0.959845
Q31	0.829597	0.959747
Q32	0.732901	0.960597
Q33	0.549436	0.962166
Q34	0.718442	0.960722
Q35	0.638328	0.961418

A measure of this magnitude indicates that the survey is internally consistent and, therefore, provides a reliable measure of user satisfaction with the BeyondMail system at AFMC. This finding is consistent with the previous research cited earlier in this text and lends a great deal of credibility to the results which follow. For the purpose of research, a measure of 0.8000 or better is deemed adequate (Tan and Lo, 1990:205).

The significance of the Cronbach's alpha coefficient can hardly be overstated. This research combined the work of two separate schools of thought into one measurement of user satisfaction. The two schools of thought correspond to Bailey and Pearson's work and Hiltz and Johnson's work mentioned in Chapter II and Chapter III. It could certainly have been possible that these two separate schools of thought would not have correlated well, or produced a high measure of internal consistency. If this had been the case, the overall measure of Cronbach's alpha would have been much lower and the value of this research instrument as a single measure of user satisfaction would have been in question. The next section describes the demographic background of the survey respondents.

Demographic Data

The Proc UNIVARIATE procedure was used with the FREQ option to calculate the number of respondents for each category of demographic data. Tables 3 through 10 list the demographic data for the survey participants. The tables correspond to survey questions 1 through 4 and 6 through 9, respectively. Information concerning the respondent's office symbol, which was the subject of survey question 5, is not given since that information was used only for data collection under the proportionate stratified sampling technique. The user's office symbol was not a variable of interest for this study.

The item listed under the heading DEMOGRAPHIC identifies the survey question or variable of interest. The items under the heading CATEGORY identify the response which categorized the respondents. For example, in Table 3, the category M refers to the number of males responding to the survey. Furthermore, the respondents are identified as either users or as Office Automation (OA) staff members with the number for each type of respondent under the appropriate heading.

TABLE 3

DEMOGRAPHIC DATA - GENDER

DEMOGRAPHIC	CATEGORY	USER	OA STAFF
GENDER	M	164	5
	F	94	3
TOTAL		258	8

TABLE 4

DEMOGRAPHIC DATA - AGE

DEMOGRAPHIC	CATEGORY	USER	OA STAFF
AGE	Less than 25	6	0
	26-32	43	1
	33-39	66	4
	40-46	70	2
	47-53	50	1
	54-60	20	0
	Over 60	3	0
TOTAL		258	8

TABLE 5

DEMOGRAPHIC DATA - EDUCATION

DEMOGRAPHIC	CATEGORY	USER	OA STAFF
EDUCATION	Less than high school	0	0
	High school diploma	14	0
	Some College	49	1
	Associate's degree	28	1
	Bachelor's degree	76	4
	Master's degree	84	2
	Doctoral degree	8	0
TOTAL		259	8

The demographic background of the survey respondents lends even more credibility to the results obtained from administering the survey. A review of the demographic data suggests that the respondents are highly educated and possess a great deal of computer experience. For example, 64.86 percent of the respondents have a bachelor's degree or higher and none of the respondents has less than a high school diploma. Also, 80.77 percent of the respondents have more than 5 years of computer experience and 37.69 percent of the respondents have more than 10 years of computer experience. Furthermore, 83.46 percent of the respondents were already familiar with electronic mail since they reported that BeyondMail was not the first electronic mail system that they had used.

Also of interest is the fact that 65 percent of the respondents had not been formally trained on using the BeyondMail system at the time the survey was administered.

This, combined with the fact that 61.15 percent of the respondents had only used the BeyondMail system for less than 6 months, might account for some of the negative responses reported in the next section. Finally, the percentage of male respondents is 63.57 percent and the percentage of female respondents is 36.43 percent.

TABLE 6

DEMOGRAPHIC DATA - COMPUTER EXPERIENCE

DEMOGRAPHIC	CATEGORY	USER	OA STAFF
COMPUTER EXPERIENCE	Less than 1.5 years	3	0
	1.5 - 3 years	15	0
	3 - 5 years	32	1
	5 - 10 years	112	3
	10 or more years	98	4
TOTAL		260	8

TABLE 7

DEMOGRAPHIC DATA - BEYONDMAIL IS THE FIRST ELECTRONIC MAIL SYSTEM USED

DEMOGRAPHIC	CATEGORY	USER	OA STAFF
BEYONDMAIL IS FIRST E-MAIL SYSTEM	Yes	43	0
	No	217	8
TOTAL		260	8

TABLE 8

DEMOGRAPHIC DATA - RESPONDENTS WHO HAVE RECEIVED TRAINING

DEMOGRAPHIC	CATEGORY	USER	OA STAFF
RECEIVED TRAINING	Yes	91	0
	No	169	8
TOTAL		260	8

TABLE 9

DEMOGRAPHIC DATA - TIME USING BEYONDMAIL

DEMOGRAPHIC	CATEGORY	USER	OA STAFF
TIME USING BEYONDMAIL	0-3 Months	104	0
	3-6 Months	55	0
	6-9 Months	51	3
	9-12 Months	30	0
	12 Months or more	20	5
TOTAL		260	8

TABLE 10

DEMOGRAPHIC DATA - DESIGNATION

DEMOGRAPHIC	CATEGORY	USER	OA STAFF
DESIGNATION	Civilian	175	6
	Enlisted	24	1
	Officer	59	1
TOTAL		258	8

Descriptive Statistics

The Proc UNIVARIATE procedure was used to calculate the means and standard deviations for each question. Table 11 lists the means and standard deviations for both the users and the Office Automation staff. Missing values were not included in the calculation. Some values were rounded to the last decimal place given in the table.

The means for the Office Automation staff were higher than the means for the users for each question of the survey. The procedure discussed in the next session was used to determine if these means are significantly different.

Overall, given the impressive technical capabilities of the BeyondMail software and the local area network used at AFMC, this researcher expected that the ratings given by the users would have been more similar to those given by the Office Automation staff. Generally, the means for the users' satisfaction level are between 4.0 and 5.0, which indicates that their satisfaction level is from neutral to somewhat satisfied, with the exception of question 17. These ratings seem to indicate that the BeyondMail system is meeting the users' needs, but that there is possibly some slight room for improvement.

It must be noted that when analyzing these means and standard deviations that the means for this particular research study are not being compared to an established

TABLE 11

MEANS AND STANDARD DEVIATIONS

	USER		QA STAFF	
VARIABLE	MEAN	STD DEV	MEAN	STD DEV
Q10	4.9498	1.3842	6.3750	0.5175
Q11	4.1081	1.5884	5.8750	1.1259
Q12	4.9112	1.3308	6.1250	0.6409
Q13	4.8101	1.3287	6.7500	0.4629
Q14	4.9457	1.3570	6.6250	0.5175
Q15	5.0193	1.3738	6.8750	0.3536
Q16	4.4115	1.4612	6.6250	0.7440
Q17	3.4549	1.7403	4.8750	1.5526
Q18	4.3101	1.4103	6.1250	0.8345
Q19	4.5197	1.1201	5.5000	1.5119
Q20	4.9154	1.4062	6.3750	0.7440
Q21	4.9615	1.5666	6.7500	0.4629
Q22	4.0276	1.6903	5.2500	1.7525
Q23	4.9962	1.4156	6.2500	0.8864
Q24	4.7344	1.2238	6.2500	0.7071
Q25	4.9577	1.5278	6.6250	0.5175
Q26	4.9500	1.4444	6.5000	0.5345
Q27	4.9884	1.4428	6.1250	0.6409
Q28	5.0000	1.3471	6.5000	0.5345
Q29	4.6269	1.6682	6.6250	0.5175
Q30	4.8610	1.5084	6.3750	0.7440
Q31	4.9653	1.4530	6.3750	0.7440
Q32	4.7441	1.4424	6.1250	0.8345
Q33	4.9646	1.4592	5.6250	1.3025
Q34	4.9919	1.5492	6.1250	0.9910
Q35	4.8730	1.4671	6.1250	0.9910

benchmark or industry standard. Therefore, interpretation of the means relies somewhat upon interpretation by the researcher and reader. For instance, while the users may not be extremely satisfied, they are at least generally more positive in their responses than they are negative. With the exception of question 17, all other questions had a mean greater than 4.0000 (neutral). While there may be some room

for improvement, the overall ratings were at least greater than 4.00, on average.

Highest Ratings. The highest rating given by the users is for question 15, which refers to the technical expertise of the Office Automation staff. This speaks well for the Office Automation staff and suggests that the users perceive that the Office Automation staff is capable of supporting the local area network and, conversely, suggests that any dissatisfaction does not stem largely from a lack of confidence in the Office Automation staff's abilities.

The second and third highest ratings given are for question 28 and question 23, respectively. Question 28 rated the users' reaction to using BeyondMail on a scale ranging from impersonal to friendly. Question 23 rated the users' overall impression of the BeyondMail system on a scale ranging from extremely bad to extremely good.

Lowest Ratings. The lowest rating given by the users is the rating given for question 17, which measures the users' satisfaction level with the degree of training the users received on how to use the BeyondMail system. Question 17 also has the largest standard deviation, which may account for the reason that it appeared to be a bad question when the first Proc CORR ALPHA procedure was performed. Furthermore, the lowest rating given by the Office Automation staff is the rating given for question 17.

These ratings may reflect the fact that 65 percent of the users and all of the Office Automation staff members who

responded to the survey reported that they had not received any training on how to use the BeyondMail system. It seems reasonable to suggest that the lack of training evidenced by the demographic information presented in Table 8 combined with the respondents' dissatisfaction with the degree of training received may have had a negative impact on the overall ratings given. Regardless of how technologically advanced an electronic mail system is, the system will not be utilized to its fullest capacity if the users are not trained on how to use the system at least well enough to know what the system's capabilities are. Training definitely presents itself as a problem which deserves attention.

The second and third lowest ratings given are for question 22 and question 11, respectively. Question 22 measured the users' satisfaction level with the ability of BeyondMail to communicate data between systems servicing different functional areas or users at other locations. Question 11 measured the users' satisfaction level with the reliability of BeyondMail.

Before proceeding with the analysis, it must be noted that a complete system failure occurred in coincidence with the administration of the survey. This event was unavoidable and was totally unrelated to the reliability of either the local area network or the BeyondMail system. The system failure was due to an accident involving a contractor's technician. The technician mistakenly pushed a

rack of equipment against the wall and damaged the network server, causing a complete system failure. While this failure was unrelated to the network or BeyondMail, it may have caused some frustration and anxiety among the users. Also, many of the users may not initially have known the cause of the failure and, thereby, have mistakenly associated the failure with the system's reliability, which may help explain the low rating for question 11. The low rating given for question 22 (the ability to communicate between systems servicing different functional areas or users at other locations), however, cannot be explained by this researcher and therefore warrants further investigation.

Comments. Section IV of the survey provided the respondents with the opportunity to make comments. The comments received were consistent with the ratings given. In fact, of the 72 negative comments received, the two most frequent negative responses dealt with training (27) and reliability (17). The other negative comments were evenly dispersed among a variety of items, including poor integration with other systems, abuse of distribution lists, messages inappropriate for electronic mail, and the need for private mail groups and a better address system.

The comments suggest that users are dissatisfied with the lack of training and the reliability of the system. In regards to training, users generally stated that they were unable to use the system to its fullest capacity without

proper training. In fact, many of the comment sheets returned by the respondents dealt only with training. This suggests that training was a serious enough problem to cause the survey respondent to take the time and effort required to make written comments. Training was the primary source of user dissatisfaction reported on the comment sheets.

Also, in regards to reliability, the users stated a dissatisfaction with the amount of time the system was inoperative. Many users also complained that the system's rate of message delivery varied too much. Several users commented that the system may take as little as a few minutes to deliver a message on some occasions while taking more than a day on other occasions. Such a comment seems odd to this researcher, but the number of respondents making the same comment justifies further investigation.

In contrast to the many negative comments, there were only 18 positive comments. The positive comments ranged from stating that the system is user friendly to simply stating that the user liked BeyondMail. Also, the positive comments were less detailed than the negative comments. Overall, the comments tend to reinforce the analysis of the mean ratings given by the users.

Pearson Correlation Coefficients

To show the degree to which the various questions relate to one another, the Proc CORR procedure was used to calculate the Pearson correlation coefficients (r) for all

possible combinations of questions. A copy of all coefficients is attached in Appendix D. For the purpose of analysis, only those coefficients greater than 0.7500 are listed in Table 12. Due to missing values in the data, only 223 cases were included in this procedure. Also, the p-value for all coefficients is 0.0001. Since the p-values are the same, they are not reproduced throughout Table 12.

The value of Pearson's correlation coefficient (r) is given under the heading (r) in Table 12. Also, the questions being correlated are listed to the left of the coefficient (r) under the headings VAR 1 and VAR 2. For example, question 20 is correlated to question 23 with a coefficient of value 0.78990. Furthermore, question 20 is correlated to question 31 with a coefficient of value 0.76218.

TABLE 12

PEARSON CORRELATION COEFFICIENTS (r)

CORRELATED VARIABLES		(r)
VAR 1	VAR 2	
Q20	Q23	0.78990
Q20	Q31	0.76218
Q25	Q26	0.88812
Q25	Q27	0.80324
Q25	Q28	0.76298
Q26	Q27	0.75206
Q26	Q28	0.77244
Q27	Q28	0.77984
Q30	Q31	0.89758

These high correlations illustrate the manner in which the questions are related to one another. For example, question 20 measures the users' satisfaction with BeyondMail's perceived utility or productivity, and question 31 rates BeyondMail as either unproductive or productive. For all intents and purposes, these two questions are virtually the same except for the type of rating scale used and the exact wording of the question. This is the same indication that was given by the Cronbach's alpha coefficient for the survey. Specifically, the questions all measure the same construct and there is a great deal of correlation among the items.

The similarities are present in the other correlations listed in Table 12. For instance, question 25 is highly correlated to questions 26, 27, and 28. Question 25 measures the users' view of the language/mechanics of the BeyondMail system on a scale ranging from confusing to understandable. Similarly, question 26 measures the users' view of the language/mechanics of the BeyondMail system on a scale ranging from unfriendly to friendly. It seems reasonable that if the user finds the language/mechanics of the BeyondMail system to be understandable, then the user would also find the language/mechanics to be friendly.

This reasoning is true for questions 27 and 28 as well. Question 27 describes BeyondMail as being either hard to learn or easy to learn and question 28 rates the users' reaction to BeyondMail as being either impersonal or

friendly. Again, if the user finds the language/mechanics of BeyondMail to be understandable, then the user should also find BeyondMail easy to learn and friendly.

This reasoning also applies to the correlation between question 30 and question 31. Question 30 asks for the users' reaction to using BeyondMail in terms of being either time wasting or time saving, and question 31 describes BeyondMail as either unproductive or productive. The correlation lies in the reasoning that if the system saves time, then the system must be productive.

Other than these similarities, it is noteworthy that question 20 is highly correlated to question 23. Question 23 asks for the users' overall satisfaction with BeyondMail and question 20 asks for the users' satisfaction with the utility or productivity of BeyondMail. Of all the measures, productivity correlates most closely to the overall satisfaction level. This would seem to indicate that, overall, productivity, or utility is an important aspect for users at AFMC.

Users Compared to the Office Automation Staff

The Proc TTest procedure was used to determine if the mean satisfaction level of the Office Automation staff is significantly different from the mean satisfaction level of the users. Table 13 lists the p-values for each test. The p-value indicates the level at which the researcher can conclude that a significant difference between means exists.

TABLE 13

USERS' SATISFACTION LEVEL COMPARED TO
OFFICE AUTOMATION STAFF SATISFACTION LEVEL

H_o: The means are equal

Variable	P-Value
Q10	0.0001
Q11	0.0020
Q12	0.0007
Q13	0.0001
Q14	0.0001
Q15	0.0001
Q16	0.0001
Q17	0.0235
Q18	0.0004
Q19	0.0166
Q20	0.0006
Q21	0.0001
Q22	0.0452
Q23	0.0135
Q24	0.0006
Q25	0.0001
Q26	0.0001
Q27	0.0011
Q28	0.0001
Q29	0.0001
Q30	0.0004
Q31	0.0007
Q32	0.0076
Q33	0.2074
Q34	0.0411
Q35	0.0174

This determination is made by comparing the p-value of the test, which is listed in Table 13 under the heading P-Value, to the reference p-value. The reference p-value for th research is 0.10. If the p-value of the test, which is given in the table, is less than the reference p-value of 0.10, then the researcher can conclude that there is a significant difference between the means. Under this

condition, the researcher is rejecting the null hypothesis that the means are equal and accepting the alternative hypothesis that the means are not equal. This use of the test p-value given in a table and the reference p-value of 0.10 applies to all of the statistical tests presented in the remainder of Chapter IV.

For example, except for question 33, all of the p-values given in Table 13 are less than the reference p-value of 0.10. Therefore, except for question 33, the null hypothesis that the users' mean satisfaction level is equal to the Office Automation staff's satisfaction level is rejected and the alternative hypothesis that the means are not equal is accepted.

By comparing the means listed in Table 11, it is clear that the Office Automation staff's satisfaction level is significantly higher than the users' satisfaction level with the one exception previously noted. This fact suggests that there is, indeed, slight room for improvement since the Office Automation staff so clearly views the electronic mail system as being more effective than do the users.

Question 33 asked the respondent how frequently he or she felt overloaded with information. Since the p-value of the test given in Table 13 is higher than the reference value of 0.10, the researcher must fail to reject the null hypothesis that the mean satisfaction levels are different in regard to question 33. This indicates that the OA staff and the users do not differ in their feeling of being

overloaded with information. Furthermore, given their ratings of 5.6250 and 4.9646, respectively, it seems that being overloaded with information is not a significant problem with the BeyondMail system at AFMC.

Statistical Tests for Demographic Questions 1, 6, and 7

The Proc TTest procedure was used to analyze questions 1, 6, and 7 since these questions had only two possible responses. A Proc TTest compares two separate groups. A Proc ANOVA procedure is appropriate when comparing more than two groups, which is the case for questions 2, 3, 4, 8, and 9 (Schlotzhauer and Littell, 1991:224-227).

These statistical tests also use a reference p-value of 0.10. However, these tests apply only to the users surveyed and do not apply to the Office Automation staff members surveyed. For each demographic variable, only those tests which produced a p-value of 0.10 or less are listed.

Tables 14, 15, and 16 share the same layout. For each table, the null hypothesis that the means are equal is stated at the top of the table. The question being examined is listed under the heading VARIABLE. For that question, the mean response is given for each type of respondent based upon the demographic variable for that test.

For example, Table 14 lists the results of the Proc TTests for the gender demographic question. The possible categories of gender include male and female. On the survey, male corresponds to a value of 1 and female

corresponds to a value of 2. Therefore, the values found under the heading CATEGORY identify the respondents as either male or female. The corresponding mean response or satisfaction level is given to the right of the category under the heading MEAN. The p-value for the question is located under the heading P-VALUE.

Question 1. The Proc TTest procedure was used to test for a significant difference in satisfaction level between male and female respondents. The procedure produced only 1 p-value of 0.10 or less. Table 14 lists the only result of this procedure with a p-value of 0.10 or less.

TABLE 14

PROC TTEST FOR GENDER

H_o: The means are equal

VARIABLE	CATEGORY	MEAN	P-VALUE
Q33	1	5.0183	0.0888
	2	4.8925	

According to the results listed in Table 14, male and female respondents have a different mean satisfaction level for question 33. Question 33 asks the respondent how frequently he or she has felt overloaded with information. These results might indicate that female users at AFMC feel slightly more overloaded with information encountered in the BeyondMail system. This test yields little real analytical value since the difference in means is only 0.1258. For all

practical purposes, a mean satisfaction level of 5.0183 is virtually the same as a mean satisfaction level of 4.8925. In fact, the p-value of 0.0888 was only slightly less than 0.10.

The real significance of the Proc TTest procedure for gender lies in the fact that male and female respondents have a different satisfaction level for question 33 only. On all other questions, there is no difference in satisfaction level based upon the respondent's gender. Therefore, gender can largely be ignored as a significant factor influencing the overall satisfaction level.

Question 6. The Proc TTest procedure was used to test for a significant difference between the mean satisfaction levels for those users who have previously used other electronic mail systems and those who have not. Table 15 lists the results of this procedure with a p-value of 0.10 or less.

Question 6 asked the respondent if the AFMC BeyondMail system was the first electronic mail system the respondent had used. The possible responses were yes and no. A response of yes is indicated in Table 15 by a value of 1 under the heading CATEGORY. A response of no is indicated by a value of 2. For example, for those respondents for whom the AFMC BeyondMail system is the first electronic mail system ever used, the mean satisfaction level for question 11 is 4.6047. Also, for question 11, the p-value of the test is 0.0245.

TABLE 15

PROC TTEST FOR QUESTION 6 - FIRST E-MAIL

H_o: The means are equal

VARIABLE	CATEGORY	MEAN	P-VALUE
Q11	1	4.6047	0.0245
	2	4.0093	
Q17	1	4.0714	0.0117
	2	3.3333	
Q22	1	4.4286	0.0924
	2	3.9481	
Q34	1	5.4146	0.0554
	2	4.9073	

This test yielded some interesting results for analysis. To begin, question 11 dealt with reliability, question 17 dealt with training, question 22 dealt with integration, and question 34 dealt with the user's ability to express his or her view by using BeyondMail. For each question, the mean satisfaction level was significantly higher for the users for whom this was the first electronic mail system used. This seems to indicate that the respondents who had previous electronic mail experience were less satisfied with BeyondMail in these four areas. This might indicate that their expectations were not completely met. This might also indicate that the respondents who had used another electronic mail system prior to using BeyondMail were better satisfied with the other electronic

mail system in the areas of reliability, training, integration, and the ability to express one's view.

Question 7. The Proc TTest procedure was used to test for a significant difference between the mean satisfaction levels for those users who have received formal training and those who have not. Table 16 lists the results of this procedure with a p-value of 0.10 or less. The information in this table follows the same format as the previous tables.

This test produced several significant results indicating that whether or not a user had received training on how to use the BeyondMail system influenced his or her response to the eight questions listed in Table 16. For each variable (question) listed, the mean satisfaction level for those users who had received training was significantly higher than the mean satisfaction level for those users who had not received training. This indicates that training is an important factor for the Office Automation staff to consider when evaluating the effectiveness of the BeyondMail system.

The users who had received formal training found the BeyondMail system easier to learn (Q27), more productive (Q31), more user friendly (Q28), and more stimulating (Q24). than the users who had not received formal training. These users also reported a better understanding of the system (Q16) and less trouble with the volume of output (Q13). In

fact, the p-value for question 16 was a highly significant 0.0002.

TABLE 16

PROC TTEST FOR QUESTION 7 - TRAINING

H_0: The means are equal

VARIABLE	CATEGORY	MEAN	P-VALUE
Q10	1	5.1667	0.0657
	2	4.8343	
Q13	1	5.0444	0.0379
	2	4.6845	
Q16	1	4.8681	0.0002
	2	4.1657	
Q18	1	4.6444	0.0034
	2	4.1310	
Q24	1	4.9545	0.0276
	2	4.6190	
Q27	1	5.2198	0.0460
	2	4.8623	
Q28	1	5.1978	0.0680
	2	4.8935	
Q31	1	5.2088	0.0355
	2	4.8333	

Furthermore, the users who received training also found that BeyondMail provided the services they wanted (Q10) and had a positive influence on their job freedom and job performance (Q18) to a higher degree than the users who had not received training. These findings are certainly reasonable and emphasize the importance of training. It would seem that user satisfaction and, therefore, system

effectiveness would increase if more users received formal training on how to use BeyondMail.

Statistical Tests for Questions 2, 3, 4, 8, and 9

The Proc ANOVA procedure was used to analyze these questions. Because questions 2, 3, 4, 8, and 9 had more than two possible responses, the Proc ANOVA procedure follows the same principles outlined for the Proc TTests reported in the previous section. The procedure compares the mean satisfaction levels for the users based upon their response to the demographic question being analyzed.

For example, the age demographic variable reported in Table 17 has seven possible responses which identify the age of the respondent. The Proc ANOVA compares the mean satisfaction level for the users based upon their age. If the p-value of the test is less than the reference value of 0.10, then the null hypothesis is rejected and the researcher concludes than there is a significant difference among the mean satisfaction levels of the users based upon the category of the demographic variable the user belongs to. The Proc ANOVA procedure, however, does not identify which categories differ. The procedure only determines that a significant difference exists.

The SCHEFFE option was used with the Proc ANOVA procedure to test for differences among the categories for each question. If the Proc ANOVA procedure finds that a significant difference among the categories exists, the

SCHEFFE option can be used to determine precisely which categories differ (Neter and others, 1990:735).

The SCHEFFE option uses a default confidence level of 0.95 in order to avoid type II errors. Therefore, even though the Proc ANOVA procedure finds that a significant difference among categories exists at the confidence level of 0.10, the SCHEFFE option may not be able to identify precisely which categories differ or by how much due to the more stringent requirement for confidence within an even smaller range of values. In the cases in this research in which the SCHEFFE option was able to identify which categories differ, the results are indicated in the appropriate table. For example, Table 17 indicates that a significant difference exists among the age categories for question 25. The p-value for this question is 0.0007, which is highly significant.

Furthermore, within the age category, the SCHEFFE option shows that a significant difference exists between category 2 and category 6 respondents. This information is found under the heading SCHEFFE COMPARISONS. For question 25, the information under this heading is read as 2 minus 6. The difference between the mean satisfaction level for category 2 and the mean satisfaction level for category 6 is found under the heading DIFF BET MEANS.

The corresponding value for the difference between means for this question is 1.4477. Since the difference is a positive value, it is concluded that age category 2

respondents had a higher satisfaction level than age category 6 respondents. By referring to the questionnaire, it is determined that category 2 corresponds to the age group 26-32 and category 6 corresponds to the age group 54-60. This indicates that the younger users find the language/mechanics of the BeyondMail system to be more understandable than do the older users. Such a finding suggests that the older users have not adapted to the BeyondMail system as well as the younger users have. For a complete description of the categories that follow, refer to the questionnaire.

Question 2. The Proc ANOVA procedure with the SCHEFFE option was used to test for significant differences among the means for users based upon their age. There were seven possible responses to question 2. Table 17 lists the results of this procedure with a p-value of 0.10 or less.

Of all the statistical tests, this test produced the second largest number of significant results. The age of the respondent, therefore, must have a considerable impact upon the respondent's satisfaction level when compared to other demographic variables. Also, many of the test p-values were highly significant, with p-values as low as 0.0007. In fact, only three tests had p-values higher than 0.0500.

The SCHEFFE option identified several differences among the age categories. According to the results for question 25, the younger respondents of age category 2 (age 26-32)

TABLE 17

PROC ANOVA FOR QUESTION 2 - AGE

H_o: The means are equal

VARIABLE	P-VALUE	SCHEFFE COMPARISONS	DIFF BET MEANS
Q13	0.0149		
Q16	0.0220		
Q20	0.0162		
Q23	0.0673		
Q25	0.0007	2 - 6	1.4477
Q26	0.0092		
Q27	0.0007	2 - 4 2 - 6	0.9854 1.4982
Q28	0.0132		
Q29	0.0147		
Q31	0.0105		
Q32	0.0084	2 - 5	1.0800
Q33	0.0095		
Q34	0.0930		
Q35	0.0834		

found the BeyondMail system to be less confusing and more user friendly than did the older respondents of age category 6 (age 54-60). The difference between these two means was 1.4477.

Also, for question 27, the younger respondents of age category 2 (age 26-32) found the BeyondMail system to be

easier to learn than did the older respondents of both age category 4 (age 40-46) and age category 6 (age 54-60). The differences between these means were 0.9854 and 1.4982, respectively.

Finally, for question 32, the younger respondents of age category 2 (age 26-32) were less distracted by the mechanics of the BeyondMail system than were the respondents of age category 5 (age 47-53). The difference between these two means was 1.0800.

These results suggest that, in several areas, the younger respondents were better able to adjust to the new system than were the older respondents. In fact, the younger respondents had the higher satisfaction level in all comparisons for this test. For all practical purposes, category 2 (age 26-32) was the lowest age category tested since there were only 6 respondents in category 1 (less than 25).

Question 3. The Proc ANOVA procedure was used to test for a significant difference among the mean satisfaction levels for users based upon their level of education. There were seven possible responses for question 3. The SCHEFFE option did not yield any significant results for factor level comparisons for question 3. Table 18 lists the results of this procedure with a p-value of 0.10 or less.

The results of this test indicate that the respondent's education level was not a highly significant influence on the respondent's satisfaction level except for questions 12,

15, 24, and 32. This might be partially attributed to the fact that so many of the respondents had a high level of education as indicated in Table 5. In fact, there were not even any respondents to compare for the first category (less than a high school diploma) and there were only 14 respondents without some college credit.

TABLE 18

PROC ANOVA FOR QUESTION 3 - EDUCATION

H_o: The means are equal

VARIABLE	P-VALUES
Q12	0.0877
Q15	0.0853
Q24	0.0577
Q32	0.0794

Question 4. The Proc ANOVA procedure with the SCHEFFE option was used to test for a significant difference among the mean satisfaction levels for users based upon how long the respondent had used a computer. There were five possible responses to question 4. Table 19 lists the results of this procedure with a p-value of 0.10 or less.

This test found little difference in satisfaction levels based upon the respondent's computer experience. The SCHEFFE option found only one significant difference among the categories. Specifically, the respondents with the most computer experience (10 or more years) had a better

understanding of the BeyondMail system than the respondents with only 3 to 5 years of experience. The existence of only one significant difference is somewhat surprising in that computer experience might reasonably be expected to impact upon a user's ability to operate a new electronic mail system. However, except for question 16, the results indicate that computer experience was generally of no help.

TABLE 19

PROC ANOVA FOR QUESTION 4 - COMPUTER EXPERIENCE

	H_o: The means are equal		
VARIABLE	P-VALUE	SCHEFFE COMPARISONS	DIFF BET MEANS
Q14	0.0698		
Q15	0.0494		
Q16	0.0049	5 - 3	0.9133

Question 8. The Proc ANOVA procedure with the SCHEFFE option was used to test for significant differences among the mean satisfaction levels for users based upon how long the users had been using the BeyondMail system. There were five possible responses to question 8. Table 20 lists the results of this procedure with a p-value of 0.10 or less.

As expected, of all demographic variables, this variable produced the largest number of significant results. The Proc ANOVA procedure found significant differences among

TABLE 20

PROC ANOVA FOR QUESTION 8 - TIME USING BEYONDMAIL

H_o: The means are equal

VARIABLE	P-VALUE	SCHEFFE COMPARISONS	DIFF BET MEANS
Q10	0.0308		
Q11	0.0092		
Q13	0.0024	4 - 1	0.9347
Q16	0.0001	5 - 3	1.1863
		5 - 1	1.4904
		4 - 1	0.9904
Q17	0.0001	5 - 3	1.4300
		5 - 2	1.8278
		5 - 1	2.0401
Q18	0.0001	5 - 1	1.2712
		5 - 3	1.3612
		4 - 1	0.9378
		4 - 3	1.0279
Q20	0.0640		
Q21	0.0148	5 - 3	1.3706
Q22	0.0922		
Q23	0.0302		
Q27	0.0035	5 - 1	1.0962
Q29	0.0045	5 - 1	1.3058
		5 - 3	1.4059
Q30	0.0131		
Q31	0.0202		
Q34	0.0672		

the mean satisfaction levels for 15 of the survey questions. Within these 15 questions, the Proc ANOVA procedure with the

SCHEFFE OPTION found 15 significant differences among the five possible categories of respondents.

For question 13, the SCHEFFE procedure shows that the respondents with more experience (category 4, 9 - 12 months) using BeyondMail are more satisfied with the amount of information conveyed to them through the BeyondMail system than are the users with less experience (category 1, 0-3 months).

Also, for question 17, the SCHEFFE procedure shows that users with more experience using BeyondMail (category 5, 12 months or more; category 4, 9-12 months) have a better understanding of the BeyondMail system in comparison to the users with less experience (category 3, 6-9 months; category 1, 3-6 months).

For question 18, the SCHEFFE procedure shows that the users with more experience using BeyondMail (category 5, 12 months or more) are more satisfied with the degree of training than are the users with less experience (category 3, 6-9 months; category 2, 3-6 months; category 1, 0-3 months). Also, for the comparison between users with 12 months or more experience using BeyondMail and the users with only 0 to 3 months experience, the difference between means was a substantial 2.0401.

For question 18, the Scheffe procedure also shows that the more experienced users (category 5, 12 Months or more; category 4, 9-12 months) are significantly better satisfied with the changes in job performance and job freedom which

were brought about by the implementation of the BeyondMail system than are the users with less experience using BeyondMail (category 1, 0-3 months; category 3, 6-9 months).

Finally, the results for questions 21, 27, and 29 seem to also indicate that the users' satisfaction level may increase as the users gain more experience using the BeyondMail system. For each of these questions, the satisfaction levels for the more experienced users were higher than the satisfaction levels for the less experienced users.

This pattern is the same one which persisted in each of the earlier comparisons. This trend offers the Office Automation staff the hope that the effectiveness of the system will increase as users become more familiar with the system.

Question 9. The Proc ANOVA procedure with the SCHEFFE option was used to test for a significant difference among the mean satisfaction levels for users based upon their designation as either civilian, enlisted, or officer. Table 21 lists the results of this procedure with a p-value of 0.10 or less.

This test produced only a few significant results. The results indicate that the enlisted respondents (category 2) find the BeyondMail system to be more user friendly than either the civilian or officer respondents did (category 1, civilian; category 3, officer). The lack of differences

indicates that, overall, the designation of the respondent has little impact upon the respondent's mean satisfaction level.

TABLE 21

PROC ANOVA FOR QUESTION 9 - DESIGNATION

H_o: The means are equal

VARIABLE	P-VALUE	SCHEFFE COMPARISONS	DIFF BET MEANS
Q28	0.0230	2 - 1	0.7712
		2 - 3	0.8270
Q34	0.0684		

Summary

This chapter described the data which was collected by administering the research instrument in accordance with the methodology provided in Chapter III. The information collected by this survey consisted of Cronbach's alpha coefficients, demographic information, descriptive statistics, correlation coefficients, and statistical tests. This information will be used to form the conclusions presented in Chapter V.

V. Conclusions and Recommendations

Introduction

This research was designed to provide an objective measurement of system effectiveness for the BeyondMail electronic mail system installed at AFMC. This effort was intended to determine if the users were completely satisfied with the electronic mail system and, therefore, were using the system to its fullest capacity.

In order to provide an objective measurement of system effectiveness for AFMC's electronic mail system, the following research questions were addressed:

1. What is system effectiveness in relation to this particular electronic mail system, and how should it be measured?
2. What measurement instruments can be adapted, modified, or created to measure effectiveness as it is defined for this problem?
3. If a measurement instrument is administered, what do the results of the measurement indicate, and how do the results compare to the Office Automation staff's perceptions?

This research determined that user satisfaction was the best possible measure of system effectiveness and that user satisfaction should be measured subjectively. A review of the literature related to this topic revealed two available questionnaires which could be modified and combined to

provide a subjective measurement of user satisfaction. This research instrument was administered at AFMC and the results of that measurement are provided in Chapter IV.

This chapter draws conclusions based upon the analysis of the research data, offers recommendations which the Office Automation staff might use to increase the effectiveness of the electronic mail system, suggests topics for further research, and summarizes the research effort.

Conclusions

Overall, the BeyondMail electronic mail system is meeting the users' needs at AFMC. Given the fact that, with one exception, the mean satisfaction levels were more positive than they were neutral or negative, the users are more satisfied than they are dissatisfied. If there was any great dissatisfaction present among the users at AFMC, there would certainly have been many mean satisfaction levels below 4.0000 (neutral). Therefore, it seems relatively easy to conclude that there is no major problem with user satisfaction.

In this respect, however, the mean satisfaction levels could also have been higher than they were, which indicates that user satisfaction and system effectiveness could be improved. For example, all mean satisfaction levels were between 3.4549 and 5.0193. Only two means were above 5.0000. The survey questions were rated on a Likert scale with values ranging from 1 to 7. A value of 7 was the most

positive response possible and a value of 4 was a neutral response. In order for this researcher to conclude that the BeyondMail system is as effective as it could possibly be, there would have to be more mean satisfaction levels closer to 6.0000 or 7.0000. The fact that none of the mean satisfaction levels even came close to 6.0000 indicates that there is room for improvement.

Also, it appears that the satisfaction level is steadily increasing as users gain more experience with the BeyondMail system. The amount of time an individual has used the BeyondMail system is the single most significant factor affecting user satisfaction level. Those individuals who have used the system the longest had significantly higher satisfaction levels in response to several questions.

Alternatively, this fact also suggests that a learning curve exists which initially has a negative impact on user satisfaction and system effectiveness. This impact is evidenced by the fact that as little as three months of experience using BeyondMail produced highly significant differences in satisfaction levels among users. Also, several users made written comments stating that BeyondMail seemed to offer so many extensive features that they had difficulty learning how to use the system and, therefore, found the BeyondMail system to not be as productive as it should be.

The technical capabilities of the BeyondMail system are extremely impressive to this researcher. The BeyondMail

system at AFMC is a state-of-the-art electronic mail package which offers a comprehensive list of features. Therefore, it seems reasonable to expect that training would be essential for the user to fully utilize the BeyondMail system. Unfortunately, however, only 35 percent of the users had received training at the time the research instrument was administered. This statistic must certainly be related to the fact that satisfaction with training received the lowest overall score from users. The mean satisfaction level of 3.4549 is well below neutral (4.0000) and clearly indicates the users' dissatisfaction with training, or the lack thereof.

Another factor of interest is the age of the individual and how the individual's age influences user satisfaction. The data showed that older users were significantly less satisfied with the BeyondMail system in several areas. Assuming that older employees at AFMC generally hold higher-level positions, it appears that more senior-level personnel find the BeyondMail system to be less effective than do other users within the organization. Senior-level personnel probably have less time to learn how to use a new system such as BeyondMail since their duties do not involve extensive computer use. Therefore, training is even more important for the senior-level personnel in order to reduce the negative impacts of the learning curve associated with a new technology such as the BeyondMail system at AFMC.

Finally, the research instrument which was adapted and modified for this study provided a useful measure of user satisfaction with the BeyondMail system at AFMC. The data collected by administering the research instrument provided valuable findings which were presented in Chapter IV. While the results of this analysis are applicable only to AFMC, the research instrument can be a useful tool for other organizations which have recently installed an electronic mail system or plan to do so. Other organizations within the Air Force or within the Department of Defense could easily adapt and modify this research instrument to meet their specific needs.

Recommendations

This research was designed to measure user satisfaction with the BeyondMail system at AFMC as an indicator of the system's effectiveness. Based upon the findings presented in Chapter IV, the following recommendations are offered to the Office Automation staff at AFMC.

1. The most important recommendation that this researcher can make to the Office Automation staff at AFMC is the recommendation to consider providing comprehensive training to all BeyondMail users at AFMC. A special training program should be developed for the senior-level personnel within AFMC. This program should be tailored to meet their needs while considering their time constraints. Also, other users should be provided with a choice of either

an extensive, detailed training program for first-time BeyondMail users or a less extensive program for experienced BeyondMail users. Finally, periodic training could help keep users current and provide opportunities for the users to ask specific questions.

2. The AFMC Office Automation staff should periodically administer the survey to determine if user satisfaction is increasing or decreasing and to measure the effectiveness of any training programs which may have been initiated. The survey should be administered once every three months for at least one year as part of a longitudinal study. Such a longitudinal study should provide a more complete understanding of system effectiveness.

3. The survey questionnaire should be modified slightly before it is administered. To begin, change question 4 (How long have you used a computer?) and question 8 (How long have you been using the BeyondMail system?) so that the categories are mutually exclusive. For example, the categories for question 8 should have been:

1. 0-3 months
2. 4-6 months
3. 7-9 months
4. 10-12 months
5. 13 months or more

Also, add a demographic question to the survey which asks the user to identify his or her specific level of responsibility within the organization. Question 9, for instance, asked the user to identify himself or herself as either a civilian, an enlisted member, or an officer. A

question should be added which further identifies the respondent as either O-1, O-2, O-7, GS-1, GS-9, E-1, E-9, etc., so that senior-level personnel can be compared to other levels.

Suggestions for Further Research

Throughout the course of this research project four suggestions for further research have presented themselves as important areas for further study. These areas offer the prospective researcher a variety of items to investigate.

1. Administer this research instrument to other organizations with similar electronic mail systems to further refine and validate the research instrument. Further refinement and validation would make this research instrument a more useful tool for organizations throughout the Air Force and the Department of Defense.

2. Examine other possible measures of system effectiveness which could be used in conjunction with this research instrument to provide a more thorough assessment of system effectiveness.

3. Provide further justification for, or argument against, the conclusion that user satisfaction is the best possible surrogate measurement of system effectiveness for electronic mail systems. This would involve the development of quantitative measures of system effectiveness based upon an economic cost and benefit analysis. Such a quantitative measure could also help an organization determine if an

electronic mail system would increase an organization's productivity or effectiveness before the electronic mail system was actually purchased and installed. User satisfaction measurements, on the other hand, are only available after system development and implementation.

4. Examine the factors which affect user satisfaction and how those factors influence the effectiveness of an electronic mail system. Relevant factors might include items such as age, education, or job satisfaction. Factor analysis could be used as a tool to identify which factors should be included in future studies of user satisfaction in relation to electronic mail systems.

Summary

This research has added to the body of knowledge concerning the effectiveness of electronic mail systems. Specifically, it has combined the efforts of several earlier researchers into a single research instrument which can be used by organizations throughout the military and the civilian communities to measure the effectiveness of their electronic mail systems and to use that measurement to improve the effectiveness of their systems.

The use of this research instrument at AFMC provided several significant findings which the Office Automation staff can use to improve the BeyondMail system. The BeyondMail system represents an investment of several million dollars by a single organization within the Air

Force. Likewise, other organizations within the Air Force and the Department of Defense will certainly be investing significant amounts of limited resources in the development and installation of electronic mail systems. This research has given those organizations a readily available evaluation tool which can be used in its present form with little or no modification.

Appendix A: Survey

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE MATERIEL COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

25 MAR 1993

FROM: AFMC/CS

SUBJ: Electronic Mail Customer Satisfaction Survey

TO: AFMC Survey Participants

1. Please take a few minutes to complete the attached questionnaire and return it by 23 Apr 93.

2. This survey measures your level of satisfaction with the Beyond Mail electronic mail system and seeks your comments on the system's effectiveness. The information you provide will become part of an Air Force Institute of Technology (AFIT) research project and will help us to determine whether or not the electronic mail system is an effective tool for your daily communications and office needs.

3. Your responses will be combined with those from other respondees and will not be attributable to you personally. Although your participation is completely voluntary, I would appreciate your help. If you have any questions, please contact Capt Randall Bradford, AFIT/LA, 58989, or Maj Maureen C. Casey, 615 SMSQ/CIMR, 76962.

Kenneth E. Eickmann
KENNETH E. EICKMANN
Major General, USAF
Staff Director

Instructions

1. Please respond to each question if at all possible. If you cannot answer a question because you don't understand it or because you don't want to answer it, then skip that question and go on to the next question. Select ONLY ONE response per question.

2. Record your responses on the answer sheet provided. Begin with the row marked 001 and end with the row marked 035. Record your answer to question 5 on the survey itself and also on the return envelope. Record your answer to all other questions on the answer sheet provided.

3. The responses will be machine scored, so please mark your answers with a No. 2 pencil and blacken the appropriate circle completely. Please erase any stray marks and do not fold the answer sheet.

4. The last section of the questionnaire provides you with the opportunity to make comments or suggestions. You may comment on any aspect of the BeyondMail system or the survey. Your comments are welcomed and will not be attributed to you personally in any manner.

5. When you have completed the survey, please place the questionnaire and answer sheet in the envelope provided. Mark your office symbol on the outside of the envelope and seal it. Return the survey to:

Capt Bradford
c/o Maj Casey
CINC
Post 180
Building 266

THANK YOU FOR PARTICIPATING!

Section I. Background

1. What is your gender?

    1. Male
    2. Female

2. What is your age?

    1. Less than 25
    2. 26-32
    3. 33-39
    4. 40-46
    5. 47-53
    6. 54-60
    7. Over 60

3. What is your highest level of education?

    1. Less than a high school diploma
    2. High school diploma or equivalent
    3. Some college courses but no degree
    4. Associate's degree or certificate
    5. Bachelor's degree
    6. Master's degree
    7. Doctoral degree

4. How long have you used a computer?

    1. Less than 1.5 years
    2. 1.5 - 3
    3. 3 - 5
    4. 5 - 10
    5. 10 or more years

5. What is your office symbol? (Be Specific)
   Record your answer here AND on the return envelope.

6. Is this (BeyondMail at AFMC) the first electronic mail system you have used?

   1. Yes
   2. No

7. Have you received formal training on using the BeyondMail system?

   1. Yes
   2. No

8. How long have you been using the BeyondMail System?

   1. 0-3 months
   2. 3-6 months
   3. 6-9 months
   4. 9-12 months
   5. 12 months or more

9. What is your designation?

   1. Civilian
   2. Enlisted
   3. Officer

Section II. Satisfaction with Electronic Mail

This section asks you to evaluate your level of satisfaction/dissatisfaction with the BeyondMail electronic mail system.

How satisfied are you with...

10. Relevancy The degree to which BeyondMail provides the services you want or require.

1	2	3	4	5	6	7
Extremely Dissatisfied			Neutral			Extremely Satisfied

11. Reliability The reliability of BeyondMail.

1	2	3	4	5	6	7
Extremely Dissatisfied			Neutral			Extremely Satisfied

12. Completeness The comprehensiveness of BeyondMail's services and capabilities.

1	2	3	4	5	6	7
Extremely Dissatisfied			Neutral			Extremely Satisfied

13. Volume of output The amount of information conveyed to you through BeyondMail.

1	2	3	4	5	6	7
Extremely Dissatisfied			Neutral			Extremely Satisfied

14. Relationship with the Office Automation (OA) staff The interaction between you and the OA staff.

1-------2-------3-------4-------5-------6-------7
Extremely Dissatisfied | Neutral | Extremely Satisfied

15. Technical expertise of the OA staff The computer technology skills and expertise exhibited by the OA staff in the area of technical support.

1-------2-------3-------4-------5-------6-------7
Extremely Dissatisfied | Neutral | Extremely Satisfied

16. Understanding of systems How well you understand BeyondMail and its use.

1-------2-------3-------4-------5-------6-------7
Extremely Dissatisfied | Neutral | Extremely Satisfied

17. Degree of training The amount and quality of instruction you received to develop your proficiency in utilizing the BeyondMail system.

1-------2-------3-------4-------5-------6-------7
Extremely Dissatisfied | Neutral | Extremely Satisfied

18. Job effects The changes in job freedom and job performance resulting from the implementation of the BeyondMail system.

1-------2-------3-------4-------5-------6-------7
Extremely Dissatisfied | Neutral | Extremely Satisfied

19. Security of data The safeguarding of data from misappropriation or unauthorized alteration or loss.

1	2	3	4	5	6	7
Extremely Dissatisfied			Neutral			Extremely Satisfied

20. Perceived utility Your judgement about the usefulness or productivity of the BeyondMail system.

1	2	3	4	5	6	7
Extremely Dissatisfied			Neutral			Extremely Satisfied

21. Convenience of access The ease or difficulty with which you utilize BeyondMail.

1	2	3	4	5	6	7
Extremely Dissatisfied			Neutral			Extremely Satisfied

22. Integration of systems The ability of BeyondMail to communicate/transmit data between systems servicing different functional areas or users at other locations.

1	2	3	4	5	6	7
Extremely Dissatisfied			Neutral			Extremely Satisfied

Section III. Satisfaction with Electronic Mail

The following questions ask you to evaluate your level of satisfaction/dissatisfaction with the BeyondMail electronic mail system by using a different type of scale.

23. Overall, the BeyondMail system is...

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

24. I find using the BeyondMail system to be...

1	2	3	4	5	6	7
Boring			Neutral			Stimulating

25. I find the language/mechanics of the BeyondMail system...

1	2	3	4	5	6	7
Confusing			Neutral			Understandable

26. I find the language/mechanics of the BeyondMail system...

1	2	3	4	5	6	7
Unfriendly			Neutral			Friendly

Please indicate your reactions to using BeyondMail:

27.

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

Hard to Learn Neutral Easy to Learn

28.

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

Impersonal Neutral Friendly

29.

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

Frustrating Neutral Not Frustrating

30.

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

Time Wasting Neutral Time Saving

31.

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

Unproductive Neutral Productive

How frequently have you felt:

32. ...distracted by the mechanics of the BeyondMail system?

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

33. ...overloaded with information?

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

34. ...unable to express your views?

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

35. ...unable to get an impression of personal contact?

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

Section IV. Comments

Please use this section to make any comments or suggestions which may help the Air Force Materiel Command provide you with the best electronic mail system possible. Any comments you make will be strictly confidential.

Thank you!

Appendix B: Raw Data (Users)

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Appendix C: Raw Data (Office Automation Staff)

```
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```

Appendix D: Correlation Coefficients

Correlation Analysis

Cronbach Coefficient Alpha

for RAW variables : 0.962413
for STANDARDIZED variables: 0.962832

	Raw Variables		Std. Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
Q10	0.726432	0.960673	0.728011	0.961099
Q11	0.633258	0.961525	0.635552	0.961891
Q12	0.733520	0.960654	0.734384	0.961044
Q13	0.655216	0.961271	0.655547	0.961721
Q14	0.528811	0.962275	0.531884	0.962771
Q15	0.531298	0.962273	0.534320	0.962750
Q16	0.612784	0.961643	0.609208	0.962116
Q17	0.478262	0.963243	0.478898	0.963217
Q18	0.719111	0.960725	0.719778	0.961170
Q19	0.433458	0.962827	0.433474	0.963597
Q20	0.789469	0.960135	0.790426	0.960559
Q21	0.787121	0.960083	0.784869	0.960608
Q22	0.592484	0.962014	0.593166	0.962252
Q23	0.827542	0.959810	0.828518	0.960229
Q24	0.760724	0.960518	0.762147	0.960804
Q25	0.761387	0.960332	0.761922	0.960806
Q26	0.773632	0.960258	0.772983	0.960711
Q27	0.763309	0.960338	0.760742	0.960816
Q28	0.824436	0.959914	0.825974	0.960251
Q29	0.810359	0.959841	0.807557	0.960411
Q30	0.815357	0.959845	0.814650	0.960349
Q31	0.829597	0.959747	0.828536	0.960228
Q32	0.732901	0.960597	0.731041	0.961073
Q33	0.549436	0.962166	0.549851	0.962619
Q34	0.718442	0.960722	0.716270	0.961200
Q35	0.638328	0.961418	0.638563	0.961866

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 223

	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Q10	1.00000 0.0	0.58958 0.0001	0.74453 0.0001	0.55194 0.0001	0.39887 0.0001	0.40610 0.0001	0.37492 0.0001
Q11	0.58958 0.0001	1.00000 0.0	0.56297 0.0001	0.50189 0.0001	0.36133 0.0001	0.44118 0.0001	0.28135 0.0001
Q12	0.74453 0.0001	0.56297 0.0001	1.00000 0.0	0.53096 0.0001	0.43143 0.0001	0.37827 0.0001	0.36917 0.0001
Q13	0.55194 0.0001	0.50189 0.0001	0.53096 0.0001	1.00000 0.0	0.32747 0.0001	0.27253 0.0001	0.48202 0.0001
Q14	0.39887 0.0001	0.36133 0.0001	0.43143 0.0001	0.32747 0.0001	1.00000 0.0	0.74867 0.0001	0.37354 0.0001
Q15	0.40610 0.0001	0.44118 0.0001	0.37827 0.0001	0.27253 0.0001	0.74867 0.0001	1.00000 0.0	0.32345 0.0001
Q16	0.37492 0.0001	0.28135 0.0001	0.36917 0.0001	0.48202 0.0001	0.37354 0.0001	0.32345 0.0001	1.00000 0.0
Q17	0.35593 0.0001	0.27907 0.0001	0.31078 0.0001	0.39610 0.0001	0.35137 0.0001	0.30481 0.0001	0.55475 0.0001
Q18	0.57235 0.0001	0.51645 0.0001	0.51450 0.0001	0.58777 0.0001	0.40589 0.0001	0.38004 0.0001	0.42752 0.0001
Q19	0.32585 0.0001	0.42203 0.0001	0.36188 0.0001	0.34165 0.0001	0.32483 0.0001	0.35962 0.0001	0.23284 0.0005
Q20	0.63768 0.0001	0.55512 0.0001	0.68766 0.0001	0.59694 0.0001	0.41374 0.0001	0.42905 0.0001	0.45583 0.0001
Q21	0.58522 0.0001	0.54364 0.0001	0.61385 0.0001	0.48273 0.0001	0.32240 0.0001	0.37402 0.0001	0.53968 0.0001
Q22	0.43681 0.0001	0.53650 0.0001	0.55642 0.0001	0.45246 0.0001	0.28686 0.0001	0.29876 0.0001	0.32330 0.0001
Q23	0.69373 0.0001	0.59733 0.0001	0.71822 0.0001	0.60780 0.0001	0.42544 0.0001	0.40809 0.0001	0.44430 0.0001
Q24	0.60820 0.0001	0.50076 0.0001	0.60074 0.0001	0.52041 0.0001	0.40888 0.0001	0.41968 0.0001	0.43843 0.0001
Q25	0.53729 0.0001	0.36841 0.0001	0.56320 0.0001	0.44684 0.0001	0.33953 0.0001	0.36999 0.0001	0.57999 0.0001
Q26	0.55002 0.0001	0.42004 0.0001	0.55777 0.0001	0.46692 0.0001	0.33283 0.0001	0.35673 0.0001	0.55209 0.0001

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 223

	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Q27	0.50876 0.0001	0.33303 0.0001	0.49822 0.0001	0.42333 0.0001	0.39744 0.0001	0.41586 0.0001	0.68189 0.0001
Q28	0.57880 0.0001	0.47362 0.0001	0.59868 0.0001	0.53184 0.0001	0.47197 0.0001	0.48782 0.0001	0.52220 0.0001
Q29	0.55881 0.0001	0.53044 0.0001	0.58571 0.0001	0.45715 0.0001	0.38578 0.0001	0.43316 0.0001	0.58124 0.0001
Q30	0.62170 0.0001	0.55703 0.0001	0.63719 0.0001	0.53446 0.0001	0.35441 0.0001	0.38337 0.0001	0.41013 0.0001
Q31	0.62147 0.0001	0.56213 0.0001	0.64504 0.0001	0.58481 0.0001	0.36575 0.0001	0.40509 0.0001	0.40679 0.0001
Q32	0.49696 0.0001	0.41746 0.0001	0.47391 0.0001	0.40628 0.0001	0.38926 0.0001	0.35073 0.0001	0.50286 0.0001
Q33	0.28880 0.0001	0.30424 0.0001	0.30277 0.0001	0.39613 0.0001	0.34956 0.0001	0.33479 0.0001	0.35434 0.0001
Q34	0.59568 0.0001	0.45450 0.0001	0.53078 0.0001	0.49225 0.0001	0.37171 0.0001	0.33074 0.0001	0.40605 0.0001
Q35	0.44858 0.0001	0.37279 0.0001	0.42398 0.0001	0.43881 0.0001	0.32430 0.0001	0.29373 0.0001	0.40372 0.0001

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 223

	Q17	Q18	Q19	Q20	Q21	Q22	Q23
Q10	0.35593 0.0001	0.57235 0.0001	0.32585 0.0001	0.63768 0.0001	0.58522 0.0001	0.43681 0.0001	0.69373 0.0001
Q11	0.27907 0.0001	0.51645 0.0001	0.42203 0.0001	0.55512 0.0001	0.54364 0.0001	0.53650 0.0001	0.59733 0.0001
Q12	0.31078 0.0001	0.51450 0.0001	0.36188 0.0001	0.68766 0.0001	0.61385 0.0001	0.55642 0.0001	0.71822 0.0001
Q13	0.39610 0.0001	0.58777 0.0001	0.34165 0.0001	0.59694 0.0001	0.48273 0.0001	0.45246 0.0001	0.60780 0.0001
Q14	0.35137 0.0001	0.40589 0.0001	0.32483 0.0001	0.41374 0.0001	0.32240 0.0001	0.28686 0.0001	0.42544 0.0001
Q15	0.30481 0.0001	0.38004 0.0001	0.35962 0.0001	0.42905 0.0001	0.37402 0.0001	0.29876 0.0001	0.40809 0.0001
Q16	0.55475 0.0001	0.42752 0.0001	0.23284 0.0005	0.45583 0.0001	0.53968 0.0001	0.32330 0.0001	0.44430 0.0001
Q17	1.00000 0.0	0.42848 0.0001	0.26478 0.0001	0.30488 0.0001	0.35414 0.0001	0.29072 0.0001	0.28987 0.0001
Q18	0.42848 0.0001	1.00000 0.0	0.37549 0.0001	0.63169 0.0001	0.53822 0.0001	0.47113 0.0001	0.66026 0.0001
Q19	0.26478 0.0001	0.37549 0.0001	1.00000 0.0	0.37391 0.0001	0.34848 0.0001	0.34427 0.0001	0.32040 0.0001
Q20	0.30488 0.0001	0.63169 0.0001	0.37391 0.0001	1.00000 0.0	0.68927 0.0001	0.57539 0.0001	0.78990 0.0001
Q21	0.35414 0.0001	0.53822 0.0001	0.34848 0.0001	0.68927 0.0001	1.00000 0.0	0.59320 0.0001	0.71292 0.0001
Q22	0.29072 0.0001	0.47113 0.0001	0.34427 0.0001	0.57539 0.0001	0.59320 0.0001	1.00000 0.0	0.61756 0.0001
Q23	0.28987 0.0001	0.66026 0.0001	0.32040 0.0001	0.78990 0.0001	0.71292 0.0001	0.61756 0.0001	1.00000 0.0
Q24	0.32365 0.0001	0.62719 0.0001	0.34454 0.0001	0.63658 0.0001	0.62393 0.0001	0.51483 0.0001	0.72735 0.0001
Q25	0.38066 0.0001	0.48757 0.0001	0.28861 0.0001	0.56493 0.0001	0.60988 0.0001	0.34713 0.0001	0.61061 0.0001
Q26	0.37883 0.0001	0.52785 0.0001	0.29237 0.0001	0.54684 0.0001	0.62709 0.0001	0.38102 0.0001	0.61711 0.0001

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 223

	Q17	Q18	Q19	Q20	Q21	Q22	Q23
Q27	0.45198 0.0001	0.46667 0.0001	0.23696 0.0004	0.53580 0.0001	0.61540 0.0001	0.38059 0.0001	0.62707 0.0001
Q28	0.38779 0.0001	0.57632 0.0001	0.37486 0.0001	0.60992 0.0001	0.64258 0.0001	0.44054 0.0001	0.70535 0.0001
Q29	0.38738 0.0001	0.57983 0.0001	0.34053 0.0001	0.66195 0.0001	0.73964 0.0001	0.54035 0.0001	0.67790 0.0001
Q30	0.36092 0.0001	0.74657 0.0001	0.32614 0.0001	0.72991 0.0001	0.69246 0.0001	0.52044 0.0001	0.72895 0.0001
Q31	0.38432 0.0001	0.72265 0.0001	0.35526 0.0001	0.76218 0.0001	0.68790 0.0001	0.56212 0.0001	0.74907 0.0001
Q32	0.33571 0.0001	0.45334 0.0001	0.31298 0.0001	0.52770 0.0001	0.64503 0.0001	0.40561 0.0001	0.56304 0.0001
Q33	0.20822 0.0018	0.33876 0.0001	0.18291 0.0062	0.41604 0.0001	0.42755 0.0001	0.15754 0.0186	0.39461 0.0001
Q34	0.37326 0.0001	0.50051 0.0001	0.22802 0.0006	0.53430 0.0001	0.56510 0.0001	0.39142 0.0001	0.58636 0.0001
Q35	0.26694 0.0001	0.40918 0.0001	0.23770 0.0003	0.49613 0.0001	0.49361 0.0001	0.31645 0.0001	0.54249 0.0001

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 223

	Q24	Q25	Q26	Q27	Q28	Q29	Q30
Q10	0.60820 0.0001	0.53729 0.0001	0.55002 0.0001	0.50876 0.0001	0.57880 0.0001	0.55881 0.0001	0.62170 0.0001
Q11	0.50076 0.0001	0.36841 0.0001	0.42004 0.0001	0.33303 0.0001	0.47362 0.0001	0.53044 0.0001	0.55703 0.0001
Q12	0.60074 0.0001	0.56320 0.0001	0.55777 0.0001	0.49822 0.0001	0.59868 0.0001	0.58571 0.0001	0.63719 0.0001
Q13	0.52041 0.0001	0.44684 0.0001	0.46692 0.0001	0.42333 0.0001	0.53184 0.0001	0.45715 0.0001	0.53446 0.0001
Q14	0.40888 0.0001	0.33953 0.0001	0.33283 0.0001	0.39744 0.0001	0.47197 0.0001	0.38578 0.0001	0.35441 0.0001
Q15	0.41968 0.0001	0.36999 0.0001	0.35673 0.0001	0.41586 0.0001	0.48782 0.0001	0.43316 0.0001	0.38337 0.0001
Q16	0.43843 0.0001	0.57999 0.0001	0.55209 0.0001	0.68189 0.0001	0.52220 0.0001	0.58124 0.0001	0.41013 0.0001
Q17	0.32365 0.0001	0.38066 0.0001	0.37883 0.0001	0.45198 0.0001	0.38779 0.0001	0.38738 0.0001	0.36092 0.0001
Q18	0.62719 0.0001	0.48757 0.0001	0.52785 0.0001	0.46667 0.0001	0.57632 0.0001	0.57983 0.0001	0.74657 0.0001
Q19	0.34454 0.0001	0.28861 0.0001	0.29237 0.0001	0.23696 0.0004	0.37486 0.0001	0.34053 0.0001	0.32614 0.0001
Q20	0.63658 0.0001	0.56493 0.0001	0.54684 0.0001	0.53580 0.0001	0.60992 0.0001	0.66195 0.0001	0.72991 0.0001
Q21	0.62393 0.0001	0.60988 0.0001	0.62709 0.0001	0.61540 0.0001	0.64258 0.0001	0.73964 0.0001	0.69246 0.0001
Q22	0.51483 0.0001	0.34713 0.0001	0.38102 0.0001	0.38059 0.0001	0.44054 0.0001	0.54035 0.0001	0.52044 0.0001
Q23	0.72735 0.0001	0.61061 0.0001	0.61711 0.0001	0.62707 0.0001	0.70535 0.0001	0.67790 0.0001	0.72895 0.0001
Q24	1.00000 0.0	0.62300 0.0001	0.66321 0.0001	0.57009 0.0001	0.69141 0.0001	0.57888 0.0001	0.66703 0.0001
Q25	0.62300 0.0001	1.00000 0.0	0.88812 0.0001	0.80324 0.0001	0.76298 0.0001	0.68661 0.0001	0.58612 0.0001
Q26	0.66321 0.0001	0.88812 0.0001	1.00000 0.0	0.75206 0.0001	0.77244 0.0001	0.68018 0.0001	0.62162 0.0001

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 223

	Q24	Q25	Q26	Q27	Q28	Q29	Q30
Q27	0.57009 0.0001	0.80324 0.0001	0.75206 0.0001	1.00000 0.0	0.77984 0.0001	0.69670 0.0001	0.58353 0.0001
Q28	0.69141 0.0001	0.76298 0.0001	0.77244 0.0001	0.77984 0.0001	1.00000 0.0	0.65875 0.0001	0.67158 0.0001
Q29	0.57888 0.0001	0.68661 0.0001	0.68018 0.0001	0.69670 0.0001	0.65875 0.0001	1.00000 0.0	0.71157 0.0001
Q30	0.66703 0.0001	0.58612 0.0001	0.62162 0.0001	0.58353 0.0001	0.67158 0.0001	0.71157 0.0001	1.00000 0.0
Q31	0.66971 0.0001	0.60035 0.0001	0.60728 0.0001	0.58938 0.0001	0.67801 0.0001	0.71420 0.0001	0.89758 0.0001
Q32	0.56637 0.0001	0.62362 0.0001	0.64249 0.0001	0.68342 0.0001	0.61002 0.0001	0.68011 0.0001	0.62277 0.0001
Q33	0.38747 0.0001	0.49203 0.0001	0.48759 0.0001	0.50494 0.0001	0.53264 0.0001	0.46919 0.0001	0.50710 0.0001
Q34	0.47712 0.0001	0.56604 0.0001	0.57203 0.0001	0.59034 0.0001	0.61895 0.0001	0.63333 0.0001	0.60121 0.0001
Q35	0.48782 0.0001	0.54666 0.0001	0.56920 0.0001	0.52657 0.0001	0.59332 0.0001	0.48766 0.0001	0.50472 0.0001

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 223

	Q31	Q32	Q33	Q34	Q35
Q10	0.62147	0.49696	0.28880	0.59568	0.44858
	0.0001	0.0001	0.0001	0.0001	0.0001
Q11	0.56213	0.41746	0.30424	0.45450	0.37279
	0.0001	0.0001	0.0001	0.0001	0.0001
Q12	0.64504	0.47391	0.30277	0.53078	0.42398
	0.0001	0.0001	0.0001	0.0001	0.0001
Q13	0.58481	0.40628	0.39613	0.49225	0.43881
	0.0001	0.0001	0.0001	0.0001	0.0001
Q14	0.36575	0.38926	0.34956	0.37171	0.32430
	0.0001	0.0001	0.0001	0.0001	0.0001
Q15	0.40509	0.35073	0.33479	0.33074	0.29373
	0.0001	0.0001	0.0001	0.0001	0.0001
Q16	0.40679	0.50286	0.35434	0.40605	0.40372
	0.0001	0.0001	0.0001	0.0001	0.0001
Q17	0.38432	0.33571	0.20822	0.37326	0.26694
	0.0001	0.0001	0.0018	0.0001	0.0001
Q18	0.72265	0.45334	0.33876	0.50051	0.40918
	0.0001	0.0001	0.0001	0.0001	0.0001
Q19	0.35526	0.31298	0.18291	0.22802	0.23770
	0.0001	0.0001	0.0062	0.0006	0.0003
Q20	0.76218	0.52770	0.41604	0.53430	0.49613
	0.0001	0.0001	0.0001	0.0001	0.0001
Q21	0.68790	0.64503	0.42755	0.56510	0.49361
	0.0001	0.0001	0.0001	0.0001	0.0001
Q22	0.56212	0.40561	0.15754	0.39142	0.31645
	0.0001	0.0001	0.0186	0.0001	0.0001
Q23	0.74907	0.56304	0.39461	0.58636	0.54249
	0.0001	0.0001	0.0001	0.0001	0.0001
Q24	0.66971	0.56637	0.38747	0.47712	0.48782
	0.0001	0.0001	0.0001	0.0001	0.0001
Q25	0.60035	0.62362	0.49203	0.56604	0.54666
	0.0001	0.0001	0.0001	0.0001	0.0001
Q26	0.60728	0.64249	0.48759	0.57203	0.56920
	0.0001	0.0001	0.0001	0.0001	0.0001

Correlation Analysis

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 223

	Q31	Q32	Q33	Q34	Q35
Q27	0.58938 0.0001	0.68342 0.0001	0.50494 0.0001	0.59034 0.0001	0.52657 0.0001
Q28	0.67801 0.0001	0.61002 0.0001	0.53264 0.0001	0.61895 0.0001	0.59332 0.0001
Q29	0.71420 0.0001	0.68011 0.0001	0.46919 0.0001	0.63333 0.0001	0.48766 0.0001
Q30	0.89758 0.0001	0.62277 0.0001	0.50710 0.0001	0.60121 0.0001	0.50472 0.0001
Q31	1.00000 0.0	0.57457 0.0001	0.48278 0.0001	0.65745 0.0001	0.53013 0.0001
Q32	0.57457 0.0001	1.00000 0.0	0.61145 0.0001	0.64822 0.0001	0.59695 0.0001
Q33	0.48278 0.0001	0.61145 0.0001	1.00000 0.0	0.49244 0.0001	0.55624 0.0001
Q34	0.65745 0.0001	0.64822 0.0001	0.49244 0.0001	1.00000 0.0	0.66774 0.0001
Q35	0.53013 0.0001	0.59695 0.0001	0.55624 0.0001	0.66774 0.0001	1.00000 0.0

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Capt Randall R. Bradford was born on 24 September 1965 in Heber Springs, Arkansas. He graduated from Shirley High School in 1983 and entered undergraduate studies at the University of Central Arkansas in Conway, Arkansas. He graduated with a Bachelor of Science degree in Public Administration in May 1987. He received his commission on 13 August 1987 upon graduation from Officer Training School. His first assignment was at Malmstrom AFB as a missile launch officer. His second assignment was at Eaker AFB as a squadron section commander. While at Eaker AFB, he earned a Master of Science degree in Operations Management from the University of Arkansas. In May 1992, he entered the School of Logistics and Acquisition Management, Air Force Institute of Technology.

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 1993	Master's Thesis

4. TITLE AND SUBTITLE
MEASURING USER SATISFACTION OF THE ELECTRONIC MAIL SYSTEM AT AIR FORCE MATERIEL COMMAND HEADQUARTERS AS AN INDICATOR OF THE SYSTEM'S EFFECTIVENESS

5. FUNDING NUMBERS

6. AUTHOR(S)
Randall R. Bradford, Captain, USAF

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Air Force Institute of Technology, WPAFB OH 45433

8. PERFORMING ORGANIZATION REPORT NUMBER
AFIT/GIR/LA/93D-1

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Department of the Air Force
Headquarters Air Force Materiel Command
Wright-Patterson AFB, Ohio

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)* The purpose of this study was to evaluate the effectiveness of the electronic mail system at the Air Force Materiel Command Headquarters. User satisfaction was measured as an indicator of the system's effectiveness. In order to provide an objective measurement of system effectiveness, the following research questions were addressed: (1) What is system effectiveness in relation to this particular electronic mail system, and how should it be measured? (2) What measurement instruments can be adapted, modified, or created to measure effectiveness as it is defined for this problem? (3) If a measurement instrument is administered, what do the results of the measurement indicate, and how do the results compare to the Office Automation staff's perceptions? User satisfaction was determined to be the best possible measure of system effectiveness and it was measured by administering a user satisfaction survey. The data gathered from this survey was analyzed and that analysis provided the basis for concluding that the electronic mail system was meeting the users' needs, but that the system effectiveness could be improved by providing training. Recommendations were offered to the Office Automation staff and suggestions for further research were also given.

14. SUBJECT TERMS
Electronic Mail, Local Area Networks, Data Transmission Systems, User Satisfaction, System Effectiveness

15. NUMBER OF PAGES
122

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

AFIT Control Number AFIT/GIR/LA/93D-1

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2. Do you believe this research topic is significant enough that it would have been researched (or contracted) by your organization or another agency if AFIT had not researched it?

a. Yes b. No

3. The benefits of AFIT research can often be expressed by the equivalent value that your agency received by virtue of AFIT performing the research. Please estimate what this research would have cost in terms of manpower and/or dollars if it had been accomplished under contract or if it had been done in-house.

Man Years _____ $ _____

4. Often it is not possible to attach equivalent dollar values to research, although the results of the research may, in fact, be important. Whether or not you were able to establish an equivalent value for this research (3, above) what is your estimate of its significance?

a. Highly Significant b. Significant c. Slightly Significant d. Of No Significance

5. Comments

_____ _____

Name and Grade Organization

_____ _____

Position or Title Address