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On-Line Publications: Defining Requirements for User Acceptance

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ON-LINE PUBLICATIONS: DEFINING REQUIREMENTS FOR USER ACCEPTANCE

THESIS

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The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

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THESIS

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Preface

The United States Air Force plans to make publications available with an official on-line system. The purpose of this research is to determine requirements for such a system that will foster acceptance in the user community. The results of this study should provide a starting point for analyzing the requirements for developing this system.

Researching and writing the thesis has been a tremendous learning experience for me. I would like to thank some of the people instrumental in my educational endeavor. My advisor, Major William Scott, has worked closely to guide me through the process to understand the rigors and satisfaction of academic research. Dr. Guy Shane performed the role of reader admirably and helped ensure the product met the challenging AFIT standards. In addition to my thesis board, I would like to thank Captain Bruce Lyman at HQ/SC for acting as the liaison at the sponsoring organization. Last, but certainly not least, I would like to thank my wife Kim and our children for their support. I would not have been able to complete this program without their love and patience.

J.T. Hennes

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Abstract

This study investigated user requirements for an on-line system to distribute United States Air Force publications. Requirements were gathered utilizing focus groups of users from the students and staff of the Air Force Institute of Technology. The focus groups identified requirements for the system intended to foster its acceptance within the user community.

The conceptual framework posited user involvement in the design and implementation of the new system, providing a balance between functionality and ease of use fostering user acceptance. The framework was used to examine the relationships between the users involvement in the system design and implementation and its acceptance and use.

The conceptual framework and focus groups were used for gathering data about system requirements. The inputs from the focus groups were used to develop the suggested requirements for the system. The resulting system requirements fell into the following groups: system reliability, system accessibility, search capabilities, desktop options, and hyperlink capabilities.

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I. Introduction

Background

The United States Air Force distributes Policy Directives, Instructions, Handbooks, Catalogs and other types of organizational information using CD ROM and paper copies. These methods of getting the information to the field units require an expensive physical distribution network. In addition to the physical distribution methods, there are unofficial Internet sites that provide access to some of the publications. The Air Force strategic plan for information management calls for the migration from paper to a completely electronic form of information distribution (Air Force, 1996).

The physical distribution of organizational information is expensive and wasteful. The Air Force Electronic Publishing Master Program Guide reports:

> There is an Air Force-leased GSA warehouse in Baltimore that contains Air Force publications and forms destined for distribution to field users. That warehouse is bigger than six football fields. Every MAJCOM has a smaller, but similar, facility. Each base has a similar warehouse which stores and distributes AF and MAJCOM products to the end users. We can nearly eliminate these facilities if we were to put every possible product into an electronic version that Air Force people can access on their personal computers. This will save in reduced: warehouse requirements; overhead to handle the products; and postage and transportation costs to move them from point to point. While we cannot eliminate storage and transport of every published item because some products are not easily adaptable for the electronic environment, the other 63 percent is, and we need to focus on that area. (Air Force, 1996:8)

A better method of getting this information to those who need it in the Air Force (AF) could save a significant amount of money.

The AF plan for the migration toward totally electronic publishing calls for maintaining some form of physical distribution system for a period of time into the future (Air Force, 1996). Some documents are not readily transferable to a completely electronic format as they require carbon copies, are in a specific format for display, or other similar reasons. The AF strategic publishing plan calls for focusing on the publications that are easily converted first. The reduction in distribution of paper copies of these publications offer significant savings for the AF in printing, storage, and transportation costs.

While this monetary savings is important, productivity gains could outweigh them in terms of value to the Air Force. Today the employee operating in the field looks for information in the cumbersome volumes of paper documentation. They first search the large three-ring binder of the paper table of contents, known as the "O-2," for the name and number of the publication for the topic of interest. Providing they find what they're looking for, and the publications library contains a copy of the particular instruction or other guidance, they can look up the desired topic in the appropriate binder. The information the individual finds could be inaccurate as the office of primary responsibility (OPR) may have sent out a change in policy with an interim message change (IMC) that has not been received or is not yet posted to the library volume.

Producing the information in a completely electronic format could provide many opportunities to improve the previous scenario. The individual could use a query capability to find the right information. The information would be more reliable as any changes the OPR would make could be made immediately available to the viewer. Additionally, the information discovered often references other publications, and with the

electronic format of an on-line publishing system, could link to the other publication directly. The individual would have almost instant access to the referenced document with this hypertext ability. The ability to hyperlink also exists in an on-line system. This would allow the text to reference other related text, a picture, sound clip, video, or other related material to help the individual understand the guidance quicker and more completely. The gains in increased productivity are difficult to measure in monetary terms, but could have a dramatic affect on the way we do business in the United States Air Force.

The current standard for the AF is to utilize personal computers in most work stations around the organization. The software programs the AF has standardized are Windows compatible graphical interface-type applications. The average user would benefit from the proposed publications system being interoperable with the Windows compatible environment.

Specific Purpose

The long-term solution planned for the future of AF publication is a completely electronic information system from authoring, to coordination and approval, to supplementation by lower headquarters and use (Air Force, 1996). One of the key steps in developing a system like this proposed on-line publications system is determining the requirements. Deciding what the system is supposed to do and how it will accomplish its objectives in the early phases of the project often determines the success or failure of the venture.

Research Question

The purpose of this study is to determine what the users require from an electronic publishing system in order to accept and use the system for day to day operations. Authoring, storing, and using information only on the computer is a shift from the paradigm of a fully paper-based system. What can an on-line, electronic publishing system offer users to make this change easier to deal with?

Investigative Questions

In order to answer the research question, the following investigative questions are answered in this thesis.

1. What functions should the system offer the user in terms of the work environment and/or the desktop environment?
2. On which types of items should the user be able to query the publication system: i.e. key terms, subject areas or other ideas?
3. What should the graphical interface for the on-line publications system look like?

To provide preliminary answers to these questions a qualitative research approach relying on focus groups of potential users was used.

Research Layout

The literature review in chapter II presents some underlying constructs in the relevant disciplines used to develop the conceptual framework behind determining user requirements for the system. Chapter III discusses the methodology used in setting up and performing the focus groups. Chapter IV interprets the data gathered by the focus groups to determine its usefulness for the stated purpose. The analysis of the data will show what functions the users feel are the most important and the types of items on which the

users would like to query the system. Chapter V will make conclusions and recommendations concerning the requirements for the on-line publishing system and for future areas of research.

Summary

This chapter outlined the need for and the plan of the United States Air Force to make its published information available on-line. An investigation into the user's requirements for such a system was proposed to help ensure the users would accept and use the new method of publishing information.

II. Literature Review

Introduction

This literature review covers the topics of systems development, requirements analysis, and the constructs contained in the user acceptance conceptual model to be introduced in Chapter III. The four constructs to be examined concerning the conceptual framework for this study are user satisfaction, ease of use, functionality, and user involvement. The model addresses the relationship of these constructs to the acceptance of a new information system by the user.

Electronic Publishing

The word publish means many things to many people, but most sources agree to the basic idea that it means to make public (Doty and Bishop, 1994; Peek, 1994). The common understanding includes producing a printed copy for use by others. This understanding is evolving rapidly with electronic publishing and the advances in computers and networks. The possibilities and the challenges presented by the new technology are great.

Information is the key source of wealth in the postindustrial age (Jacobson, 1994). Many companies are beginning to recognize that electronic publishing is an enterprise-wide activity to get information to those who need it (Francis, 1990). Several questions need to be answered before the electronic publishing system is designed. An organization must determine who needs to see the information, what level of the corporate data to which they should have access, whether they should be able to change the data, or who else needs to see the data (Beal, 1991). Clifford Lynch (1994) points out the need to

consider the security and integrity of the electronic information. Users need to be sure of who authored the information and that it was not altered after it was written and made available.

Steps to Electronic Publishing

The first step to electronic publishing involves moving the current paper documents to digital images on the computer. The original answer was to scan the image and make a picture of it in the computer. The problem with this method, according to Cary Lu (1993), is that the storage consists only of images and can't be read as text by the computer. Optical character recognition (OCR) was developed to solve this problem. OCR uses a scanning process that includes computer software to translate text into a computer-readable format. OCR does not work perfectly for all documents, especially those heavily formatted and those including graphics.

The next step in the move to electronic publishing is to establish a system to index your digitized paper and digital documents for search and retrieval (Lu, 1993). The ability of the computer to read the document as text is instrumental in most applications of electronic publishing. The document could still be read, but the user couldn't search for a particular topic or piece of information. There are many uses for each type of retrieval, and the use of the document will drive the method needed.

An important consideration, when developing an electronic publishing strategy, is ensuring documents can be used with various platforms and applications. The computer industry has developed standards for document exchange to help ensure this possibility. Documents can include not only text, but audio, graphics, and full motion video. They

will retain the same look and feel across and platform or application with the established industry standard for document exchange.

The lack of an industry standard for indexing electronic documents prevents a lot of information from being available on-line. Currently, you must download all the documents and run a program to index them, in order to query them for the information you desire. The other option is to use a different search query for each type of document database. Without a standard it will be difficult to mix information from outside the organization into the corporate database. Cary Lu (1993) feels it will be some time before an industry standard in this area is developed.

The current literature covers many of the theoretical issues surrounding the world of electronic publishing. The Air Force has made the decision to migrate toward this technology. The initial phase of the transition was to move the publications onto CD-ROM and distribute them to all the units around the world. This was planned as an interim step on the way to fully on-line access to publications. The next step in the migration, was to decide on Standard Generalized Markup Language (SGML) as the format for creating new documents and for converting the old text documents. Jeffrey Hibbard supports this choice with his opinion that SGML is useful for manuals, textbooks, technical reports and articles, proposals and other similar types of documents (Hibbard, 1990). This research will focus on the requirements the user has for a system of publications available on-line

Systems Development

The information systems life cycle (ISLC) presents the concept that information systems have a useful life span (Martin, 1995). The construct of the ISLC views information systems development as a four phase process. The first phase is the design of the system. Upon the completion of the design, the system is implemented and fine tuned. The third phase of the ISLC is the systems operation, including the regular maintenance of the system. The final life cycle phase is the system obsolescence or the death of the system. The life cycle points out the continuing need for new systems development projects.

Kendall and Kendall (1995) assert structured analysis and design provides a systematic approach to designing and building quality computer systems. The most widely used methodology for incorporating this systematic approach to system development is the systems development life cycle (SDLC). Kendall and Kendall (1995) provide a model of the SDLC with seven steps. They caution analysts disagree on exactly how many phases there are in the SDLC, but they laud its organized approach to systems development.

Different interpretations of the SDLC are common in field as exemplified by the various authors models (Awad, 1985; Ostle, 1985, Kendall and Kendall, 1995; and Martin, 1995). Though the different models differ in the number of steps as pointed out by Kendall and Kendall (1995), the organization the models provide to the design process is the important thing. Figure 1 depicts the SDLC as the twelve step process proposed by

Martin (1995) in his text on system analysis and design. Martin (1995) depicts the process as three major nodules including: analysis, design, and implementation.

The analyst determines if the current system has problems and what design remedies are appropriate in the analysis phase which includes five steps: problem detection, initial investigation, requirements analysis, system selection, and preliminary system design. The four steps in the design phase, the phase where the system selected in the analysis phase, include: output, input, files, and processes. Implementation, the phase of the process where logical design specifications are translated into the actual construction of the information system, includes the remaining three steps of the process: programming/testing, system change-over, and system evaluation. Martin (1995) is careful to point out the SDLC is not a completely linear process as Figure 1 might suggest. The analyst may return from any step to any of the previous steps in the process. Kendall and Kendall (1995) support this view as they state the steps of the SDLC are sequential, but are interrelated and often are accomplished simultaneously.

Requirements Analysis

One of the earliest stages in the successful development of an effective information system (IS) is a thorough understanding of the user's needs (Byrd et al, 1992). Defining user needs is commonly called requirements analysis. Requirements analysis involves end users and systems analysts interacting in an effort to recognize and specify the data and information needed to develop an information system (Byrd et al, 1992). Zmud (1983) declares requirements analysis continues to be the most critical and most difficult activity normally undertaken in information systems development.

Byrd et al (1992) list five steps commonly performed by the analyst in determining requirements:

1) working with end users to establish an understanding of organizational information processing needs
2) developing IS objectives
3) designing and evaluation IS alternatives
4) communicating the results of analyses to superiors, other analysts, and end users
5) performing a systems audit (Byrd et al, 1992:117)

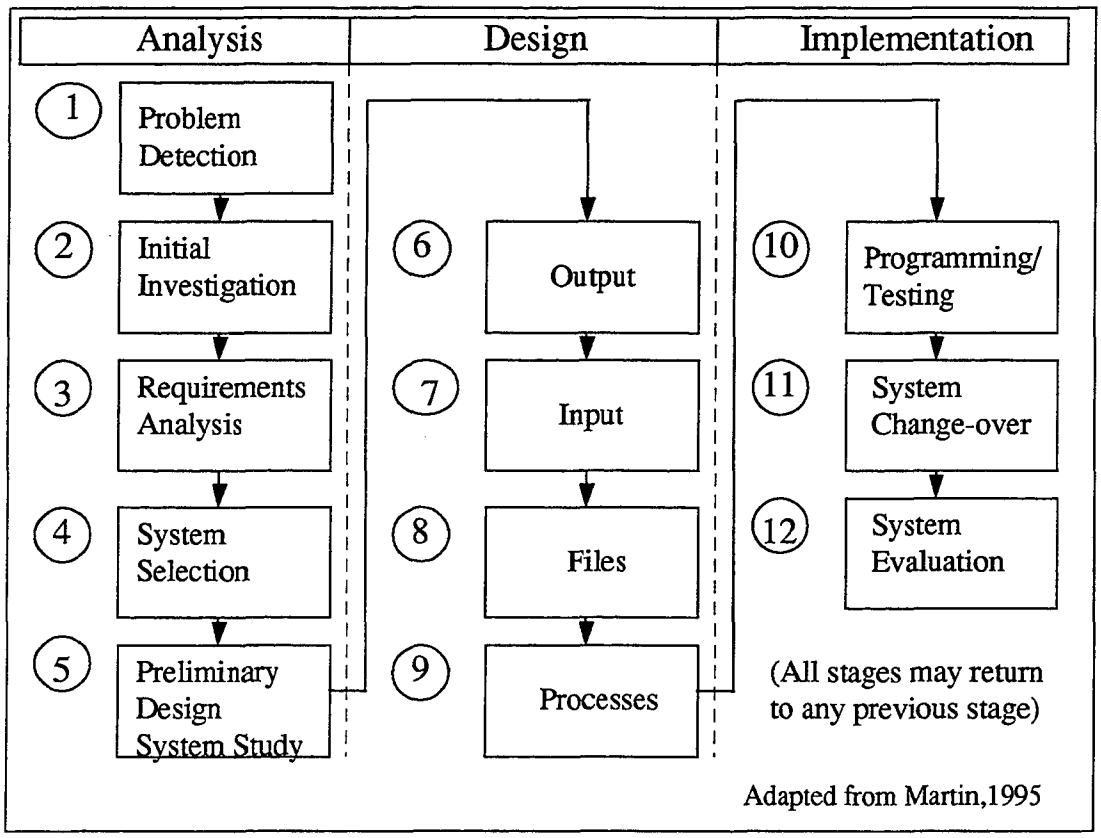


Figure 1. Stages of the Systems Development Life Cycle (SDLC)

The process appears quite clear; find out what the user wants, needs, and desires; then use this information to provide the appropriate computer system.

Jeffrey and Putman (1994) discuss two concepts that prevent the activity from being the straight-forward endeavor which it initially appears. First, defining user requirements is a complex division of labor between the technology-oriented system developers and the organization-oriented users. The developers don't understand the organization nearly as well as the users working in it on daily basis, and the users know the organization with little knowledge of the technology available to meet their needs. The second point Jeffrey and Putman (1994) discuss as a hindrance to the process is that requirements are not established as a list to be discovered, but are hard to define with clarity as the system is intended to affect a change to the organization that is already very ambiguous. The difficult part of the process comes down to communication between the users and the developers. The user knows what they want the system to do, but they don't understand what technology is available to perform the task. They must convey their desires to the technician in a manner that allows the developer to come up with a feasible solution.

Martin (1995) provides an analysis of several methods of obtaining data for the requirements gathering phase. The methods he analyzes are interviews, questionnaires, procedure analysis, and document survey. Interviews are structured one-on-one sessions the researcher scripts and tightly controls. Questionnaires ask the opinion of the users about ideas the researcher determines to be relevant. Procedure analysis involves watching the user in the natural environment to determine what they need to perform their job. Document survey entails analyzing the flow of documents through the user's processes to determine how the system could help the flow.

Morgan (1988) discusses the focus group as an another method for gathering qualitative data like system's requirements. He points out the technique is a combination of the personal interview and procedure analysis or participant observation. According to Morgan, the main advantage of the focus group over participant observation is the ability to observe a large amount of interaction in a limited period of time. He cautions the focus group lacks the natural setting of participant observation and shouldn't be used if this is important. The main advantage of focus groups over personal interviews, according to Morgan (1988) is the ability to observe interaction on a topic. The focus group offers less control by the researcher of the data gathering than the structured individual interview. The interaction of the group participants takes the place of the researcher control. According to Morgan (1988), the situation that takes advantage of the strengths of focus groups over personal interviews and participant observation is appropriate for using focus groups. The next section discusses how the dynamics of user acceptance of the system should influence the requirements analysis phase of SDLC.

User Satisfaction/Acceptance

Ives et al (1983) define user information satisfaction (UIS) as the extent to which users believe the information system available to them meets their information requirements. There has been much attention paid to the concept of user satisfaction as a measure of success of information systems and the productivity of the system users. Ives et al (1983) assert UIS is a perceptual or subjective measure of system success; it serves as a substitute for objective determinants of information system effectiveness which are frequently not available. According to Hendrickson et al (1993), an underlying tenet of

information system success is the decision maker's willingness to adopt and utilize these systems.

There has been significant research into determining user satisfaction. Bailey and Pearson (1983) created one of the earliest tools for measuring computer user satisfaction, a 39 item user satisfaction survey. Ives et al (1983) and Baroudi and Orlikowski (1988) continued their work and refined the instrument to include 22 and 13 items, respectively, which they asserted still effectively measured the user acceptance construct. Baroudi and Orlikowski (1988) define three factors these studies are built around including:

1. EDP (electronic data processing) Staff and Services. This factor is the respondents' self reported assessment of the attitude and responsiveness of the EDP staff as well as the quality of their relationship with the EDP staff.

2. Information Product. This factor is the respondents' self-reported assessment of the quality of output delivered by the information system.

3. Knowledge and Involvement. This factor is the respondents' self-reported assessment of the quality of training provided, their understanding of the system, and their participation in its development. (Baroudi and Orlikowski, 1988:48)

These early measures of user satisfaction included the measure of the EDP staff and services as the majority of the computing was performed by the department.

The increase of personal computing in the 1980s and 1990s has shifted the concept of user satisfaction away from the EDP staff and services. Doll and Torkzadeh (1988) investigated the measurement of the user satisfaction construct in relation to the growing field of end-user computing (EUC). They created a 12-item instrument to measure end user computing satisfaction (EUCS) based on five components of user satisfaction, including: content, accuracy, format, ease of use, and timeliness.

Etezadi-Amoli and Farhoomand (1996) have also developed a EUCS measure. The instrument was developed around six elements of EUCS including: documentation, ease of use, functionality of system, quality of output, support, and security. The research supported the idea that their user satisfaction measure was useful in determining user performance (Etezadi-Amoli and Farhoomand, 1996).

Davis (1989), Goodwin (1993), and Hendrickson et al (1993) demonstrate a trend in the literature arguing perceived usefulness and ease of use as the two main determinants of acceptance for an information system. Perceived usefulness, or functionality, as it is referred in this study represents the idea that people tend to use or not use an application to the extent they believe it will help them perform their job better (Davis, 1989). Despite the usefulness of a system, ease of use hypothesizes that people will only take advantage of the application if the benefits outweigh the effort of using it (Davis, 1989). These two constructs are important elements for the discussion of user acceptance of information systems.

Ease of Use

Davis (1989), Goodwin (1993), and Doll and Torkzadeh (1988) are examples of EUC-based satisfaction measures that assert ease of use is the most important element of user satisfaction. Goodwin (1993) argues ease of use, or how something is accomplished, can be as important as what functions are available in an application. Ease of use has become more important as the technology has progressed, making it an important element for consideration during the analysis of the necessary system architecture (Branscomb and

Thomas, 1984). Users with powerful personal computers expect sophisticated software to perform the functions they need, and still be easy to use.

The established user satisfaction instruments consistently use ease of use as a major element of the construct. Additionally, several works from the literature argue ease of use is the most important element of user satisfaction (Branscomb and Thomas, 1984; Doll and Torkzadeh, 1988; Goodwin, 1993).

According to Davis (1989), ease of use refers to the degree to which a person believes that using a particular system would be free from effort. Goodwin (1993) describes usability, another term for ease of use, in the following manner:

> It is affected by the types of tasks to be accomplished: A keyboard-based interface appropriate for a word-processing application may be inadequate for a graphics application. In this respect, usability, like functionality, is task related; it is also people related. The characteristics that make a system usable for one set of users may render it unusable for another. First-time, casual, and expert users may all have different requirements, and their requirements may change as they move from one level of expertise to another. (Goodwin, 1993:230)

Ease of use is supported as an integral element of user acceptance as Davis (1989) claims all else being equal an application perceived to be easier to use than another is more likely to be accepted by users.

Functionality

The construct of functionality as discussed by Goodwin (1993) refers to the program containing the functions needed to do their tasks. Functionality is equated to the content construct in the EUCS measures of Doll and Torkzadeh (1988), Etezadi-Amoli and Farhoomand (1996), and others. Etezadi-Amoli and Farhoomand (1996) found the functionality to be one of the two most important components of user satisfaction. Davis

et al (1989) produced data to suggest that ease of use may not be as important to determining user acceptance as the construct of functionality. They hypothesize the user may be willing to tolerate a difficult interface in order to access functionality that is important, while no amount of ease of use will be able to compensate for a system that doesn't do a useful task. Getting users involved in determining the requirements for functionality and ease of use is hypothesized to foster system acceptance by the users. User involvement is discussed in the next section.

User Involvement

Ives and Olson (1984) state user involvement refers to participation in the system development process by representatives of the target user group. Amoako-Gyampah and White (1993) found a strong relationship existed between user involvement in system development and implementation and user satisfaction with the system. Dodd and Carr (1994) propose the idea that user involvement falls on a continuum ranging from little user involvement as with SDLC-based development to the end user developing the system on their own with little or no help from the data services department. While Ives and Olson (1984), Amoako-Gyampah and White (1993), and Dodd and Carr (1994) support the idea that user involvement leads to user acceptance, the idea has been debated heavily in the research.

Ives and Olson (1984) reported on six studies of the user involvement related to user acceptance provided little support for user involvement. They concluded the benefits of user involvement have not been clearly demonstrated and more research is needed. Subsequently, Tait and Vessey (1988) reported that user involvement reduces the risk of

failure in complex projects. Amoako-Gyampah and White's (1993) results show user perception of level of involvement has a direct positive and significant impact on user satisfaction.

Summary

The systems development life cycle provides an organized approach to create new systems. There many different interpretations of the SDLC to organize development. Martin's twelve step model provides a useful breakout of the steps. The current research will determine the requirements for a proposed on-line publishing system for the Air Force. Requirements analysis is a difficult process of communicating the users needs to the system developers. The literature supports the concept that meeting the users needs for functionality and ease of use will help foster their acceptance of the system. Getting the users involved in determining the system requirements is argued to facilitate user acceptance.

III. Methodology

Introduction

It is generally accepted that identifying the user requirements is one of the first steps in developing successful information systems (Byrd et al, 1992). Clarifying and defining client expectations is one of the most difficult and important parts of the requirements definition process (Jeffrey and Putman, 1994). This study proposes getting the users involved in the early stages of developing the on-line publishing system for the management of the United States Air Force publications.

A common approach to defining the users' expectations is to gather information about the client organization, develop a list of functions needed or desired, and then prioritize this list (Jeffrey and Putman, 1994). The exploratory nature of the research supports the use of qualitative research methods. This study will use Miles and Huberman's (1984) model for qualitative research as discussed in the following section. This study will utilize focus groups of potential users to determine the requirements and prioritize them. Focus groups are discussed later in this chapter.

This chapter will introduce a model suggested by Miles and Huberman (1984) for performing qualitative research, and show the process the researcher used to perform the study in accordance with the methodology. The methodology included four components: data gathering, data analysis, data display, and conclusion drawing/verifying. The researcher used focus groups for the data gathering component of the model. A pilot study was performed to ensure the instrument was performed to ensure the data gathering instrument was adequate. The data analysis was performed using the model introduced in

the bin creation section of this chapter. Chapter IV will display the data gathered by the focus groups. Chapter V will be used to document the conclusions drawn and verified by the researcher about the data.

Data Analysis Methodology

The analysis of the data is an essential element of the research project, and will be performed using the model represented in Figure 2 as proposed by Miles and Huberman (1984) for analyzing qualitative data. The model shows qualitative research as a four step model including: data collection, data reduction, data display, and conclusion drawing/verifying. The authors intended the model to represent interaction between the four nodes to show the process is not linear. Data reduction, data display, and conclusion drawing/verifying are the steps associated with data analysis, and can be performed at any time during the research process.

Data Gathering. Prior to the data gathering the researcher following Miles and Huberman's methodology developed a conceptual framework for the constructs of concern to the present research. The conceptual framework is represented pictorially in Figure 3 and is discussed later in this chapter. In addition to the conceptual framework, the researcher decided upon some investigative questions prior to the data gathering phase of the research. Miles and Huberman (1984) support these actions. They argue the researcher should bring to the field some orienting ideas, foci, and tools. This should not limit the researcher with preexisting concepts of what they will find. The data gathering for this research will be described later in this chapter under the Procedure section.

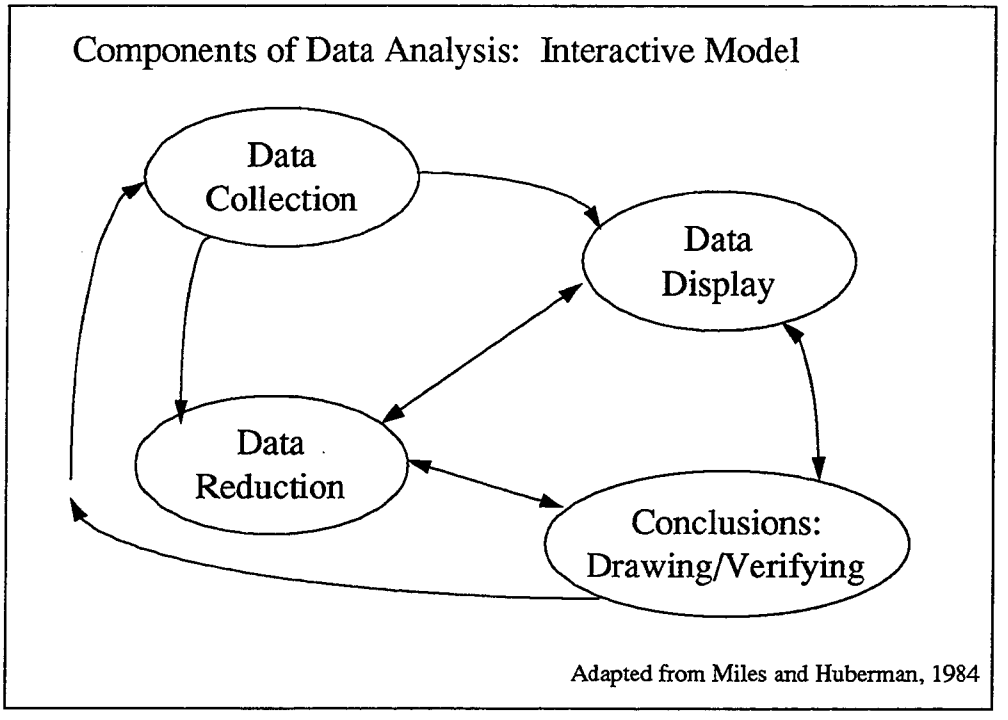


Figure 2. Interactive Model of Data Analysis

Data Reduction. Data reduction refers to the process of selecting, focusing, simplifying, abstracting, and transforming the "raw" data that appear in written-up field notes (Miles and Huberman, 1984). Building on the conceptual framework the researcher has chosen, the data can be categorized in groups or "bins" as Miles and Huberman (1984) refer to them. Grouping the ideas generated by the users will aid in the process of analyzing the data. There will be bins for the ease of use and functionality constructs included in the center of the user acceptance conceptual model from Figure 3. The data reduction for this study will be explained in the section entitled Bin Creation.

Data Display. The ideas generated by the focus groups will be listed under the appropriate bin categories shown in Figures 4 and 5. The results will be listed separately

for each investigative question and for each focus group. The data from the individual groups will be combined in consolidated bins for each task. The data contained in the bins will be displayed in Chapter IV.

Conclusion Drawing/Verifying. Conclusion drawing starts at the very beginning as the researcher comes up with ideas about what things mean at the earliest stages of the project (Miles and Huberman, 1984). The researcher looks for patterns, regularities, explanations, possible configurations, causal flows, and propositions to help reach conclusions, concerning the data gathered in the project. In addition to drawing conclusions, the researcher attempts to verify the results through arguments supported by the literature, discussions with other researchers, or with careful review of the data (Miles and Huberman, 1984). Conclusion drawing and verifying are discussed in Chapter V.

User Acceptance Model

The conceptual framework for this study is shown in Figure 3. The model shows user acceptance relies on the two key constructs of functionality and ease of use of a new information system. Previous research supports this approach (Davis, 1989; Goodwin, 1993; Doll and Torkzadeh, 1988; and Etezadi-Amoli and Farhoomand, 1996). Additionally, the earlier research supports the concept that user involvement in the early stages of the project design is of paramount importance in determining the requirements the user has for the functionality and ease of use. User acceptance is improved by user involvement in the determination of requirements for functionality of the system and its ease of use.

Focus Groups

According to Krueger (1988), a focus group can be defined as a carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, nonthreatening environment. He lists five characteristics or features of a focus group: (a) people, who (b) possess certain characteristics, (c) provide data (d) of a qualitative nature (e) in a focused discussion (Krueger, 1988). Morgan (1988) argues that the results of focus groups can stand on their own as valid research.

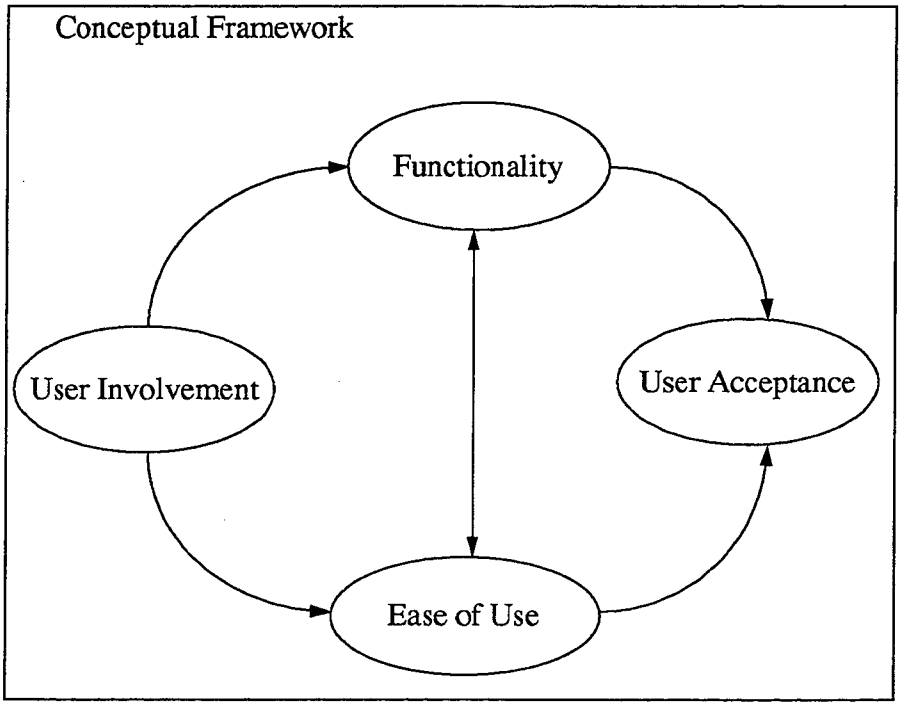


Figure 3. User Acceptance Conceptual Model

The data from the focus groups will be used to answer the investigative questions raised in Chapter I.

1. What functions should the system offer the user in terms of the work environment and/or the desktop environment?

2. On which types of items should the user be able to query the publication system: i.e. key terms, subject areas or other ideas?

3. What should the graphical interface for the on-line publications system look like?

The next section discusses the characteristics of the people who participated in the focus groups.

Participants

The participants in the focus groups were volunteers from the students and staff of the Air Force Institute of Technology (AFIT), who come from all areas of the organization. The volunteers were solicited through a briefing to the AFIT administrative staff at the Commandant's weekly staff meeting. The researcher asked for students and staff members who were interested in providing input from the user's perspective about the requirements for an on-line publications system for the United States Air Force. Volunteers were sought who were experienced with various computer interfaces and/or the Air Force publications system.

The groups in this study met Krueger's characteristics that define the concept of a focus group. They were made up of (a) people, (b) who would be users of the proposed system, (c) they would provide data (d) of a qualitative nature, and (e) be led through a focused discussion. The determination of the size of each group is discussed in the next section.

Group Size. The size of the group can affect its productivity (Tubbs, 1992). Too few members limits the number of ideas the group can come up with, and even numbers of individuals makes it hard to make decisions as tie votes are possible. Larger groups tend

to spend too much time organizing and get distracted from the original goal. Bales (1954) suggests five is the optimum size for small groups to function most efficiently. Krueger (1988) suggests focus groups are typically seven to ten people, but range from four to twelve. The researcher's lack of experience as a facilitator and the arguments by Bales and Tubbs determined five would be the most productive and manageable size for the group. Five is within the acceptable range for focus groups of 4 to 12.

Pilot Study. The participants demographics are shown in Table 1. The group was composed of three males and two females. The rank structure of the group was four Captains and one Major. The scale for the remaining statements on the Personal Information Worksheet asked the respondent to report a numerical score from one for disagree to seven for agree. The members reported an average of 5.8 for the statement, "I consider myself experienced with the general use of computers." They reported an average score of 5 for the statement, "I've experienced many different types of computer interfaces." On the final statement, "I'm an experienced user of USAF publications," the group's average score was 3.8. Two members reported scores of one, while the other group members had significantly higher scores of five, five, and seven.

Table 1. Demographic Data for Pilot Study

Member	Gender	Rank	Computer Experience	Interface Experience.	Publications Experience
1	Male	Capt	6	6	5
2	Female	Capt	5	4	1
3	Male	Maj	4	3	5
4	Female	Capt	7	6	7
5	Male	Capt	7	6	1
		Average	5.8	5	3.8

Group One. The first focus group was comprised of three candidates for master's degrees from the December 1997 AFIT class and two librarians from the AFIT Library. The demographics for this group appear in Table 2. The group was comprised of three females and two males, three Air Force officers and two Civil Servants. The data from the worksheet shows the members considered themselves experienced in the general use of computers as the average score for the group was 6.0 on the same scale as discussed in the pilot study group. They were not as experienced with different interfaces and with AF publications as the average score on these two items was 4.4.

Table 2. Demographic Data for Group One

Member	Gender	Rank	Computer Experience	Interface Experience.	Publications Experience
1	Male	1Lt	7	6	5
2	Male	Capt	7	4	5
3	Female	GS-10	6	6	3
4	Female	GS-9	4	4	5
5	Female	Capt	6	2	4
		Average	6	4.4	4.4

Group Two. The second focus group was comprised of three members of the Communications Directorate at AFIT, a secretary in the Logistics and Acquisition School of AFIT, and a master's candidate in the December 1996 AFIT IRM program. The demographics for this group are displayed in Table 3. The group reported an average score of 6.2 for the statement, "I consider myself experienced in the general use of computers." The group average of 4.6 showed they were less confident they had experience with different computer interfaces. The final question rated the members'

reported experience with the AF publishing system. The team reported an average score of 4.8.

Table 3. Demographic Data for Group Two

Member	Gender	Rank	Computer Experience	Interface Experience.	Publications Experience
1	Male	MSgt	4	2	6
2	Female	GS-5	6	4	3
3	Male	Capt	7	7	5
4	Male	2Lt	7	6	3
5	Female	SRA	7	4	7
		Average	6.2	4.6	4.8

Procedure

Upon arrival, the participants were greeted and seated at desks positioned in a semi-circle with the open side facing a flip-pad and a dry-erase board. They were asked if they objected to the project being video taped for future analysis of the session. There were no objections, but the research would have used an audio recording as a substitute. They were read a scripted brief of the background behind the project that is included at the top of Appendix A. The general procedure was scheduled for 1½ hours. The various tasks are listed below followed by a discussion of the detailed procedures for each focus group.

1. The participants were given a handout (see Appendix A) that contained a paragraph concerning the project scope and an agenda with approximate times for completing each task. They were asked to read the project scope and ask any questions they had at that point about the project.

2. The first task the participants were required to complete was to fill out a personal information sheet (see Appendix B). This task was scheduled for 3 minutes and asked for some basic information about them and their experience with computers and AF Publications.

3. Following the personal information sheet, the participants were given five minutes to work as a team to work on task two; a copy of the task is included as Appendix C (Scannell and Newstrom, 1991). The task required the members to think creatively to come up with the answers to the puzzle. The task was intended to be an ice breaker, foster group cohesiveness, and act as an aid to creativity.

4. For task three, the participants brainstormed for 30 minutes on investigative question one, "what functions should the system offer the user in terms of the work environment and/or the desktop environment?" They were encouraged to ask for clarification if they didn't understand what they were being asked to do. The researcher acted as the recorder, writing the ideas generated by the group on the flip-chart. As the pages were filled with ideas they were removed from the flip-chart stand and put up on the wall for the participants to see as they continued brainstorming.

5. The participants were then given 10 minutes for task four to brainstorm ideas about investigative question two, "on which types of items should the user be able to query the publication system: i.e. key terms, subject areas or other ideas?" Again the author acted as the recorder and the same procedure was used.

6. The participants' fifth task was to use the dry-erase board and the flip-chart to come up with a depiction of what the screen should look like to answer investigative question three, "what should the graphical interface for the on-line publications system look like?" They were encouraged to select someone to take the markers and begin to draw some mock screens of what they wanted the system to look like. They had 30 minutes for this task.

7. The final task requested of the group was to prioritize the ideas generated by task three and four. They were each given 50 Post-it ® notes to vote for the functions they felt were the most important and 50 to vote for the most important types of things for which the user should be able to query the system. They were given 10 minutes to place the sticky notes directly on the flip chart pages with the listed ideas to cast their votes.

Pilot Group

Focus Group Introduction. The first focus group was performed as a pilot study using a group composed of people from the masters program for information resource management (IRM) graduating from the Air Force Institute of Technology (AFIT) in

December 1996. The group was homogenous as they were all Air Force officers attending the same school. They were comfortable together in the very early stages of the group interaction as they sat down and talked among themselves. The group was quick to ask questions about the project and for clarification of the instructions. Overall, the group was very relaxed and involved in the process from the beginning

Task One: Personal Information Worksheet. The first organized activity of the focus group was to fill out the personal information worksheet; a copy is included as Appendix B. One group member had little experience with publications and was unsure what number to put for the answer. After a short discussion, the respondent chose an answer. The group completed the rest of the worksheet. This section was completed in the time allotted.

Task Two: Ice Breaker. The second task for the group was to attempt the word puzzle (see Appendix C) used in this process as an ice breaker, team builder, and an aid to develop the creative energy of the group. This group already knew each other and had worked together on other occasions, so the ice breaker function of the puzzle was not as important in this case as team building and fostering the groups creativity. One group member did not participate in the task, because he didn't like word puzzles. However, the member participated in the rest of the tasks.

Task Three: Functionality. This task required the group to brainstorm ideas for investigative question one, "what functions should the system offer the user in terms of the work environment and/or the desktop environment?" One of the members asked for clarification about what the system was assumed to mean. The researcher explained the

intent was to come up with user requirements for an on-line computer system to access organizational information including operating instructions, directives, visual aids, and other manuals and pamphlets.

The group discussed accessibility, reliability and a possible backup for the proposed system. The group expressed concern about accessibility and downtime. The CD/ROM system currently used to access some publications was used as an example of this concern. The system required a CD/ROM reader on the computer and the correct software loaded onto the hard drive. Several group members talked about the limited number of computers available to read the publications. The group required the proposed system to be available on most or all computers in the organization.

The concern for the new on-line system also included the reliability. The group felt there would be times they would not be able to connect to the system or it would be down. They wanted the system to be more reliable than most on-line systems they were familiar with. Also, any backup system must have an acceptable performance level. Backup was discussed in the form of paper publications or the current CD/ROM system.

The group discussed ensuring the user had the most current version of the publication. The group members were familiar with some current Internet sites that don't guarantee the user the most current version. They assumed this should be controlled by providing the official site or sites for the Air Force. In addition to the latest version, the users wanted to be able to identify the items that changed from one version to the next. They required a section for each publication to be named "what's new," or suggested a different color text for the changes from the last version.

Within many publications are specific references to other publications for further direction or clarification. The group required the on-line system to move from the point of the reference to the section of the text referenced with a click of the mouse. They named the idea hypertext, and as the discussion continued the group added the ideas of linking to relevant tables, charts, pictures, video clips, etc. The researcher suggested the term hypermedia for this requirement.

The group expanded the linking idea with a term they labeled embedded forms. The example given for this idea was the instruction covering leave. They required the ability to pull up the leave form, while reading the leave instruction. Additionally, they discussed the idea of a link from each block of the leave form to the section of text in the instruction giving the user specific directions on how to fill in the block. Furthering this idea, the group decided a section called frequently asked questions, or an e-mail link to the office of primary responsibility (OPR) for the instruction, could help clear up any questions not clearly answered by the text of the instruction.

Task Four: Query Capability. The topic of a search capability was brought up in the discussion of the previous question concerning the functionality of the system. The researcher suggested further discussion of the function should wait for this section of the focus group. The discussion generally covered the ability for any user to find the desired information regardless of their knowledge of search tactics.

The group members required flexibility in setting the delimiters for any search they would perform. They wanted to be able to search all Department of Defense publications or narrow it down to Air Force, MAJCOM, base, or other relevant levels. The group

discussed the availability of other publications not in the user's current chain of command. A group member used the example of a person going on a temporary duty from one command to another might want to check the uniform requirements of the command and base to which they were going.

The group also required the ability to search publications with different types of queries. They expressed a requirement to perform searches for any word related to the topic they wanted and get the number of times the word appears in each publication. This requirement was labeled as a hit count. Another option requested was the ability to perform a search on designated keywords. They also wanted to be able to query the publications by title or series number. Within the publication, the group wanted the ability to search for a particular chapter, subject, section, or other levels to get to the exact information for which they are looking. The final type of search the group required was labeled as a natural language query. This entailed the ability of the user to query the system for the actual question they wanted answered. As an example they mentioned the user posing the question, "what do I need to do to go on leave?" They required the system give them a list of simple instructions with links to the appropriate forms and instructions to get the user the information to go on leave.

The final idea under this section was the desire to maintain a history of the searches the user has performed previously. The group felt the average user would perform the same type of work on more than one occasion, and the same query would take them to information they needed at a later time. The ability to save the search results or mark the publication or section of publication.

Task Five: Screen Design. The researcher asked for a volunteer to draw the group's ideas for the way the opening screens of the system would look. The researcher had to explain to the group that no artistic ability was necessary as only a crude drawing was needed. With a little delay and the threat the researcher would have to pick someone, a volunteer did step up to the flip-chart. Shortly into the initial drawing, a second individual stepped up to continue the process.

The main theme of this group on the look of the system was the desire to make it look familiar. The requirement for this was to make the system look like the Windows, Internet browsers, or other systems Air Force users are currently operating. They determined this was the way to present the interface of the system to get the users to understand it with little if any additional training.

Lessons Learned. Task one worked well for the intended purpose, and no changes were made. Task two provided two areas for improvement as the researcher determined to act as recorder for the puzzle solutions and to provide the group the answers orally. The researcher wanted the groups to work more on the communication to solve the puzzles than writing the answers. Providing a written copy of the answers to each team member, reduced the group interaction as they read the answers individually. The researcher had one of the group members record the ideas generated in tasks three and four for the pilot group. Having the one group member in front, changed their status with the rest of the group. The researcher acted as recorder for the idea generation tasks for the rest of the groups. Using both the white board and the flip chart for recording the drawings from task five worked effectively. Another change to the procedure involved

adding the voting process of task six. The pilot group was not required to vote on the ideas generated in tasks three and four, until after the fact. The researcher determined the best time to capture the opinion of the group about the ideas was at the end of the session, when the thoughts were still fresh in their minds.

Group One

Task One: Personal Information Worksheet. The group asked for no help to understand the worksheet and completed the task in the allotted time.

Task Two: Ice Breaker. This task required the group complete the word puzzle (see Appendix C) designed as an ice breaker, team builder, and as an aid to creativity for the session. The researcher handed a copy of the word puzzles to each of the members. One of the members answered several of the individual puzzles on the sheet. The researcher made several attempts to get the others involved. The first attempt was to ask the members to help decide if the answers from the active member were right. Next, the researcher asked the panel to start suggesting some ideas for the other puzzles. The attempts were successful as other members began to come up with some ideas and suggest some changes to other answers put forth.

Task Three: Functionality. The third task required the group to answer the first investigative question; "what functions should the system offer the user in terms of the work environment and/or the desktop environment?" This section describes the discussion that took place on the topic of the proposed system's desired functions.

The researcher acted as the recorder for this and subsequent idea generation tasks. The researcher was careful to record only the ideas the team generated and ask for

guidance on the wording of the phrases used on the flip-chart pad. Additionally, the researcher informed the group on several occasions to suggest corrections if the items recorded did not convey the meaning of the thoughts they were trying to convey.

At the beginning of the discussion, one of the team members asked for clarification concerning what was included in the term publications for the discussion. The researcher defined the publications to include directives, instructions, pamphlets, visual aids, and other forms of written information, but not including technical orders as they are not part of the purview of the publishing office at this time.

One of the members asked if they could complain about the CD/ROM system implemented for accessing AF publications. The researcher answered the question with the statement to the effect that they could use what the member felt was wrong to come up with suggestions for making the on-line system better than the CD/ROM. The member then stated the system needed to be widely accessible to the AF users in the field. This led to the requirement for the system to be available on virtually every computer being used for AF business.

The next topic of discussion generated the requirement to have publications updated centrally. The group required changes to publications be performed by the OPR, and be available to the users with no effort on their part. They pointed out changes on the system should be implemented with no significant delay.

The group discussed the current Internet sites providing access to some of the AF publications. They mentioned the sites usually have a disclaimer warning the publications found at the site may not be the most current version of the document. The members

required the on-line system assure the users the publications contained on it are the most current versions and contain all changes made to date. They determined a single official AF publications system should provide this security.

Team members expressed concern about an on-line system being reliable enough to count on during day-to-day operations. They didn't want a computer or communications problem to stop the work process. They felt the systems they were familiar with endured periods of downtime or slow response. They required a system of backup using paper or CD/ROM be required to keep things running smoothly during system failures or for deployments.

Deployments were another area the group was concerned with in terms of an on-line system being accessible and reliable enough for the day-to-day operations of the unit. The researcher informed the group members the Air Force Electronic Publishing Master Program Guide called for requiring CD/ROM as a backup for the on-line system for the foreseeable future (Air Force, 1996).

The experience some of the team members had with the implementation of the CD/ROM into the AF units caused some concern about how this proposed system would be implemented. The group required an implementation plan be designed up front to make the switch to the on-line system smooth and feasible.

Annual and special updates of instructions were the next topics of discussion. The group required the process be accomplished completely on-line. Related to this idea of electronic routing of the review process is the electronic routing and approval of forms.

The members determined the biggest hurdle to moving ahead with the electronic routing process was the verification of the approving official's electronic signature.

Following the discussion of electronic routing, the topic of hypertext or hyperlinking of various types of information was discussed. For example, the group required the ability to link references in the publication to pictures, graphs, charts, or other supporting material. Another example they mentioned was the ability to link from the instruction to a needed form and vice versa for an activity such as taking leave or filing a travel voucher. This requirement was labeled as embedded forms.

Similar to the linking idea of the previous paragraph, the group wanted the system to keep track of the references made in the publications. They commented how many discontinued publications have been referenced by other documents. The group wanted the system to track these references, and notify OPRs for the publications in order to correct the soon to be obsolete references. This led the group to the idea of notifying the OPR or the system administrator in the case of any errors or misunderstandings concerning the publications or the system. Group two discussed many of the same topics as the pilot group and had many similar ideas.

Task Four: Query Capability. The two librarians were only occasionally involved in the functionality discussion, but were integral to the discussion answering investigative question two, "what should the graphical interface for the on-line publications system look like?" The discussion covered several aspects of how the query system should be implemented.

The focus group team members began the discussion by explaining the requirement to query the index by publication number, series number, or by title of the publication. Additionally, the ability to search within the document for the exact location of the information was required.

The team required the word searches they performed to be available in both the title and text of the publications. They wanted a measure of the number of times the word appeared in the various publications. This requirement was labeled as a hit count. This also led to some discussion about the system providing a relativity factor for the different results returned from the search. This would require an estimate by the computer of the likelihood the hits were in the publication for which the user was looking.

The group discussed users with different levels of experience being able to use the system effectively. The suggestion first leading the group to this idea was to include options for the user to initiate some search functions such as Boolean operators, use of wild cards, and other advanced search capabilities. When they realized this ability required some previous experience, the recommendation was to provide a natural language query ability for these users.

Team members required the ability to control the scope of the search. They decided the user should be able to limit the search in different ways. The term they used for the this was to establish flexible search delimiters for narrowing the search field to their area of interest. An example of this discussed was determining to search AF level, a particular MAJCOM, and/or the base publications pertaining to their topic. Another

example of this delimiter was deciding what types of publications to search, like instructions only or instructions and visual aids.

The group discussion moved to the idea of the system keeping a history of previous searches the user had performed. The idea behind this suggestion was that users perform the same job most of the time and the search would be useful more than one time. Additionally, the group wanted the ability to mark a particular publication or sections of publication the user will go to on numerous occasions. Overall, the group wanted the search to be effective for different users, offer flexible methods to limit the search, maintain a personal history of prior searches, and offer an effective display of the information the search came up with.

Task Five: Screen Design. The first comment for the discussion about the user screen was a team member wanted the system to look like Windows. When asked by the researcher about colors for the screen, the members stated the default colors for Windows would be fine with them. The other requirement about color the group had was for the colors to be chosen with enough contrast for the user with a monochrome screen to use the system.

The team members required options for allowing the system to run faster. They wanted to be able to download the file in text only mode with a button on the screen for loading the graphics only if they needed them.

The introduction screen the group wanted would provide buttons for the key options they would use. They determined the most important function on the first screen was the search capability to help the user find the information they needed. They wanted

the button for help to lead the user through the options for limiting the search to the intended scope.

The group required the search results to link to the different publications. The user would click on the result they felt contained the information they needed and it would open up that document for them. They could read the entire document or perform another search to find the specific information for which they're looking. The screen the publication opened up on should offer the user many options, according to the group. Some examples of the requirements include being able to print the document or sections of it or put sections of the text into another document. The overall feeling toward screen design was the need for the system to be familiar to the user like the Windows interface commonly used on AF operations.

Task Six: Voting. The team members were provided two stacks of Post-it ® notes, each containing 50. The researcher had the team members put the number of notes representing their strength of opinion for the individual ideas generated. The intent of this activity was to measure the group opinion as to which functions were most important for the proposed system.

Group Two

Task One: Personal Information Worksheet. The personal information collected for this group is displayed in Table 3. The worksheet was completed in the allotted time.

Task Two: Ice Breaker. The researcher prodded the group by suggesting they say their ideas out loud to help the other members work out some of the puzzles. Two of the

members made very few inputs into the exercise. The researcher made attempts similar to those in the pilot study to get the other members involved in the task.

Task Three: Functionality. The researcher had the group answer the first investigative question, "what functions should the system offer the user in terms of the work environment and/or the desktop environment?" The researcher asked the group if there were any questions about the topic. When no questions were asked, the researcher had the group begin brainstorming ideas.

The first topic discussed by the group was the requirement for the system to provide the most current version of the document available. Later in the discussion, the group addressed how the single system, acting as the official site for obtaining publications, should provide the version control the user desired.

System reliability was determined to be a user requirement. The group talked about the fact users would start saving copies of the publications to their hard drives or printing out copies, if they thought the system might break down or not be available for some other reason. This led a team member to suggest the system allow the user to save a copy to the hard drive, and the system should identify if the publication is changed or updated.

The group discussed the need for a robust search capability. They required the ability to find specific information and go to it. The search would locate the exact location of the information the individual wanted and open the document at that point In addition to locating the specific information, a member of the group suggested the system provide the ability to download a part of a document. If everything the user needs to perform their

job is found in a single paragraph, page, or chapter, downloading the entire file is a waste of resources.

The idea of the time and resources required to download information led the group to another idea. The group wanted the ability to view the first part of the file without actually downloading the whole thing could prevent this waste. They labeled this requirement as a preview ability.

One of the members asked what could be done to allow the user to see a table or chart referenced in a document. The group quickly suggested using hypertext links could accomplish this goal. This led a team member to suggest the requirement for pointers and links to supplements and changes to the document with which the user is currently working. Talking about changes led a member to suggest a requirement for a master list of changes, updates, deletions, and other information about what is happening with the publications.

After a short pause, a suggestion was made to ensure the system didn't require the user to save a file to a drive and open a different viewer program to look at the document. It was asked by a member if there could be a function to help the user understand the meaning of the text of a publication. The group came up with the requirement for a help function, and for a link to the OPR of the document.

Accessibility of the system was the next topic discussed. The group determined the system needed to be available to everyone working on AF business. The idea of accessibility led the group to discuss system backup. The group required another method to utilize publications in the event of a temporary problem in accessing the system.

Adding to the idea, was the requirement to make the backup system work in the same manner as the on-line system.

The next topic suggested in the discussion was the need for the interface to be user friendly. The reasoning behind this suggestion was to allow an inexperienced user get the information they desire. They required the system to lead the user through the process of finding the information step-by-step. Someone quickly pointed out this option could prove to inhibit the productivity of an expert user. This led to the requirement of a multilevel help system catering to users with different levels of expertise.

Following the user friendly discussion, the topic of response time for the system was introduced. The group was concerned with two aspects of response time: (1) how long it would take to get into the system and (2) how long the files took to get to the user, or download. One option for keeping the download time to a minimum the group suggested was to offer the user of downloading the information in a text only format, and only download certain pictures or graphics contained in the document when needed. The end of the time allotted for the section was reached and the researcher asked the group if there was any last items they wanted to include in this section.

Task Four: Query Capability. This task had the group answer investigative question two, "on which types of items should the user be able to query the publication system: i.e. key terms, subject areas or other ideas?" The group had mentioned the idea of a search capability during the functionality section, and the researcher had suggested they delay further discussion on the topic until this section. The group had no questions on what was expected of them in this section.

The first thing the team required was the ability to query the system on various kinds of searches of the index. In the event the person had some idea where to find the publication, they wanted to search the index by series number or publication number. They also wanted the user to be able to query the index for keywords, subject, or words or phrases contained in the titles when they didn't have an idea what they were looking. In addition to searching the index, the group required the system provide an abstract of each document the users could query on for a keyword, word, or phrase search.

The previous searches they suggested would take the user to the particular publication for which the user searched. The group required the system also help the user find the specific information they needed within the document.

The researcher prodded the group to address the way the results of a search would look as the discussion was stopped momentarily. The group required the ability to know how many times a word from a word search was found in each publication. This requirement was labeled as a hit count. When the search yields a list of possible publications, the user should be able to quickly look or scroll through the listed publications to find the one they want. If a search presents a large list of possible publications, the user should get an option to narrow the previous search to get a lower number of more relevant publications. When searching the text of the document, the group wanted the search to take the user to the place in the document where the hit occurred. The hit or the relevant section should be highlighted to help the user find the needed information. The search results should display the OPR for the publication or the user should be able to query to find out who was the OPR. Some additional things

required in the search results might include: the size of the document in pages and/or file size, an abstract, the location with a link, and some publishing information about the item.

A member suggested the requirement for the search function to be easy to use for those who have little experience performing queries. The discussion turned to providing some more advanced search capability for the more experienced user. Another suggestion was made to provide some sort of tutorial for the more inexperienced user to take them through the steps of a more advanced search. Relating to the novice user, a member suggested some users will need the ability to ask a question of the system in English to get the answer to their question. The requirement was labeled as a natural language query.

They wrapped up the query section with a discussion of putting limits on the universe to be searched. They explained the user might know the publication they're looking for was an instruction, so searching all publications would take more time than was necessary to find what they want. In addition, they may have only wanted to know the base policy on a topic, so they wouldn't have needed to search the AF or Major Command publications. Placing limits was labeled as search delimiters.

Task Five: Screen Design. The researcher had the group make drawings to answer investigative question three, "what should the graphical interface for the on-line publications system look like?" The group did not produce a volunteer to do the drawing right away. The researcher had to explain no artistic ability was necessary to perform the job. Once the volunteer stepped up, the task moved along as planned.

The group determined the first screen should designate the system as the official AF site for electronic publications. They also expected a disclaimer at the bottom of the

screen letting everyone know the site was for official business only. Some of the options they required on the first screen included the ability to view the publications as text only and the beginning of the search function. They felt the search function would be a button with pull-down menus for choosing search and display options. The results of the search should provide the ability to narrow the search, if the results of the search were too large.

As the member was drawing the screen, the group was not talking very much. The researcher tried to generate discussion by asking the group if they felt the individual drawing the screen had picked the right color for the screen being drawn. The group agreed the color didn't matter as long as the screen presented enough contrast to see everything, and the colors did not detract from the system. This led to the requirement to standardize the font to ensure it was readable and consistent.

The group ended the discussion with the idea to provide the user access to the searches previously performed. The idea is the user will work with the same type of information more than once in the performance of the job, and would save time by preventing them from having to repeat the same search over and over.

Task Six: Voting. The researcher provided the team members with the Post-it ® notes for voting. The members again were allotted 50 votes for the ideas from task three and 50 votes for the ideas from task four. Following the data gathering section, the analysis of the data will follow a methodology suggested by Miles and Humberman (1984) for analyzing qualitative data. The approach used is outlined in the next section.

Bin Creation

Miles and Huberman (1984) support the creation of bins as a method of organizing the data gathered. The intent of the bin creation process is to determine categories the data will be entered into to further understanding. The categories were determined prior to the data gathering from constructs developed by Davis (1989). The data was gathered according to the procedure outlined earlier in this chapter, then analyzed using the video recordings for sorting into the appropriate bins and displayed in Chapter IV. The bins were used to categorize the data based on the proposed system versus the use of the publications in the paper format.

The strong support in the literature for the importance of ease of use in user acceptance led the researcher to include the construct in the conceptual model developed for the current research effort. The ease of use bins, shown in Figure 4, are based on three subcategories for ease of use developed by Davis (1989). The first ease of use bin is labeled physical effort as it refers to the ideas the users came up with to reduce the physical exertion required to get the system to achieve the desired outcome. The second bin is mental effort and refers to the ideas the users brainstormed to reduce the need to deduce or remember what commands are available and how to make them work. The final bin under the ease of use construct is labeled easy to learn. This bin is for data that relates to how the user figures out a function for the first time and remembers how to do it again in the future.

Physical effort as stated refers to the physical exertion required to accomplish a task. An example of this is the difference between using one click of the mouse to

accomplish a function and needing to physically scroll through several screens using many clicks of the mouse to find the desired function. Another difference that represents physical effort is between the user having the system located on the desk or needing to go to a special terminal somewhere remote from the work area.

Mental effort refers to the amount of effort needed to remember how to initiate a desired function. An example of this is the difference between having a button to click with the picture of a printer to know how to print versus having to remember the command to print is depress the "Control" and "P" keys at the same time. Another example for this is the ability to save the work by clicking the mouse on a button with an intuitive graphic versus knowing the function is under a pull-down window labeled "File."

Easy to learn refers to the ability to determine how to use a function for the first time. An example of this is the intuitive picture of the function on the button versus the need to look in the written documentation for the system to understand how to perform the task. Another example of easy to learn is the difference between having instructions for a desired function in an on-line help with step-by-step instructions for how to perform the function versus the help only explaining what the function does. The categories within ease of use are mutually exclusive.

Functionality, as discussed in the literature review, represents the abilities the program offers the user to help perform their job effectively. Davis (1989) also identified three subcategories for functionality. Categorizing the data from the pilot study used only two of the three subcategories and led to the exclusion of the third category from the functionality bins as pictured in Figure 5, and discussed below. Effectiveness is the first

bin under the functionality construct and refers to the system's ability to increase the user's effectiveness on the job. The second functionality bin is productivity and refers to the ability of the system to increase the productivity of the user on the job or create a time savings. The final subcategory for functionality suggested by Davis (1989) is importance and refers to the overall importance of the system to the user's job. Importance was not used as a bin as it refers to the system as a whole and its importance to the user's job, but doesn't refer to individual functions the system offers.

Job effectiveness refers to the system's ability to increase the user's effectiveness on the job. An illustration of this is when the user must look up the age of the client manually in the paper files, but with the computer system the user can now simply make a query and get the information desired. The task would have been prohibitive due to a

Ease of Use Bins		
Physical Effort	Mental Effort	Easy to Learn

Figure 4. Ease of Use Bins

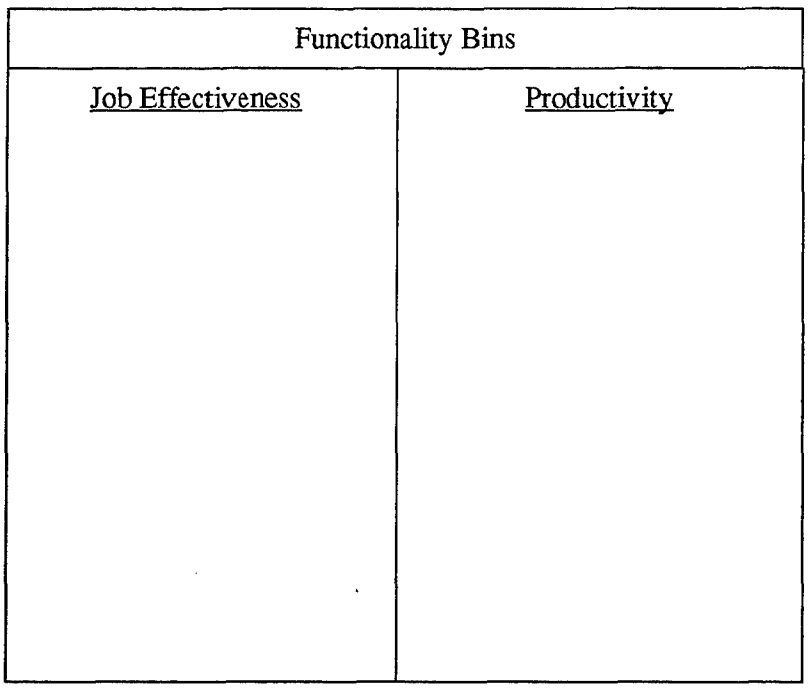


Figure 5. Functionality Bins

time constraint without the system, but is now feasible. Another example is when the user may have had to take information from a customer on a form and input it into the records at a later time, but the system allows the user to put the information into the computer as the customer reveals it.

Productivity represents the ability of the system to help the user perform the same task faster than would be possible without the function. The user could read the whole document concerning the question, but would incur a time savings if the system could locate the exact reference to the question within the document. This differs from effectiveness as the task is made faster with productivity, but would in fact be a different task or not probable without the function.

The representation of the conceptual framework in Figure 3 shows interaction between the ease of use bins and the functionality bins. This represents a nonexclusive relationship, since the same data may appear in both the ease of use and functionality bins.

The researcher categorized the data generated from task three of the pilot study. Figure 6 contains data categories in the ease of use bins, and Figure 7 contains the data categorized in the functionality bins. The researcher had a peer categorize the same data, after reading the bin creation section of this chapter, to test the construct validity of the bins. The peer categorization is presented in Figure 8 and Figure 9.

Eight of the eleven ideas the researcher placed in the physical effort bin agreed with eight of the twelve ideas placed in the peer's physical effort bin. The researcher and the peer placed six ideas in the mental effort bin with four being the same items. The researcher and the peer placed the same idea in the easy to learn bin. Both effectiveness bins received seventeen ideas with fifteen being the same. The researcher place eight ideas in the productivity bin and the peer placed nine with six being the same. Upon discussing the disagreement on the items placed in different bins, the researcher determined the bin creation section needed a statement defining the frame of reference. A statement was added concerning how the ideas would be placed in the bins under the assumption the proposed system of publications management was being compared to the paper publications system. The researcher and the peer then performed data categorization on the data gathered in task four from the pilot study. The bins from this categorization for the researcher are presented as Figure 10 and Figure 11. Figure 12 and Figure 13 depict the peer's categorization of the data from task four of the pilot study.

The researcher's physical effort bin contained eleven ideas and the peer's had ten with agreement on ten. The mental effort bins were empty for both individuals. Both easy to learn bins contained the same two items. The job effectiveness had fifteen items in agreement with the researcher having one extra item the peer didn't. The peer included one item in the productivity bin the researcher didn't, and they agreed on the one other item in the bin. The addition of the frame of reference sentence in the bin creation section increased the agreement for the second evaluation.

Ease of Use Bins		
Physical Effort	Mental Effort	Easy to Learn
Electronic coordination	Identification of changes	Help function
Integrated supplements	E-mail to OPR	
Hypertext links	Personalized bookmarks	
Hypermedia	Highlight changes	
Query/search capability	What's new section	
Index/table of contents		
Cut and paste		
Accessibility		
Hyperlink acronyms		
Personal comments		
Print capability		
Attach sections to E-mail		

Figure 6. Ease of Use Bins for Pilot Group, Task 3

Functionality Bins	
Job Effectiveness	Productivity
Electronic coordination Hypertext links Hypermedia links Query/search capability Cut and paste Electronic coordination of forms E-mail to OPR Remote access Personalized bookmarks Highlight changes Widespread access Photos/videos for explanation Backup Ability to change text size/font POC for changes Print capability Repository of publications	Integrated supplements Identification of changes Index/table of contents What's new section Publications bulletin Hyperlink acronyms Text only mode Personal comments

Figure 7. Functionality Bins for Pilot Group, Task 3

Ease of Use Bins		
Physical Effort	Mental Effort	Easy to Learn
Electronic coordination Hypertext links Hypermedia Query/search capability Cut and paste Electronic coordination E-mail to OPR Remote access Accessibility Hyperlink acronyms Personal comments Attach sections to E-mail	Index/table of contents Personalized bookmarks Highlight changes Publications bulletin What's new section	Help function

Figure 8. Peer Ease of Use Bins Pilot Group, Task 3

Functionality Bins	
Job Effectiveness	Productivity
Electronic coordination Hypertext links Hypermedia links Query/search capability Cut and paste Electronic coordination of forms E-mail to OPR Remote access Personalized bookmarks Highlight changes Widespread access Hyperlink acronyms Photos/videos for explanation Backup Personal comments Print capability Repository of publications	Integrated supplements Identification of changes Index/table of contents What's new section Publications bulletin Text only mode Backup POC for changes Repository of publications

Figure 9. Peer Functionality Bins for Pilot Group, Task 3

Ease of Use Bins		
Physical Effort	Mental Effort	Easy to Learn
Table of contents Mapping of hyperlinks Search history Word search Specific searches for headings, titles, etc. Natural language search Embedded forms Query total publications Access control Query point Search by information type		How to/ help tutorial Frequently asked questions

Figure 10. Ease of Use Bins for Pilot Group, Task 4

Functionality Bins	
Job Effectiveness	Productivity
Table of contents Mapping of hyperlinks Search history Word search Specific searches for headings, titles, etc. Natural language search Embedded forms Frequently asked questions Query total publications Security classifications Access control Query destination Authoring publications to be on-line Query point Search by information type	Search for what's new

Figure 11. Functionality Bins for Pilot Group, Task 4

Ease of Use Bins		
Physical Effort	Mental Effort	Easy to Learn
Table of contents Mapping of hyperlinks Search history Word search Specific searches for headings, titles, etc. Natural language search Embedded forms Access control Query point Search by information type		How to/ help tutorial Frequently asked questions

Figure 12. Peer Ease of Use Bins for Pilot Group, Task 4

Functionality Bins	
Job Effectiveness	Productivity
Table of contents Mapping of hyperlinks Search history Word search Specific searches for headings, titles, etc. Natural language search Embedded forms Frequently asked questions Query total publications Security classifications Access control Query destination Query point Search by information type	Search for what's new Authoring publications to be on-line

Figure 13. Peer Functionality Bins for Pilot Group, Task 4

IV. Results

Introduction

The ideas generated in tasks three and four by the groups are displayed using the bins discussed in Chapter III. The ideas were categorized according to the procedure discussed in Chapter III under the Bin Creation section which utilized peer evaluation of the categorization process to validate the effort. There are ease of use and functionality bins for each group and each task. The ideas are ordered within the bin categories from the highest vote total at the top to the lowest at the bottom. In addition to the individual group bins for each task, bins for the combined groups for each task are displayed. The data was clustered into similar types in the combined group bins. This format adds order to the data collected and facilitates drawing conclusions about the users' requirements. This chapter will also include the researchers' representation of the screens drawn by the groups in task five of the procedure, and a brief discussion of the figures.

Group One, Task Two

The task was successful as an ice breaker, as a team builder, and as an aid to increasing the group's creativity. The members began talking and working together during the exercise. The puzzles required the creative thinking to figure out the correct answers.

Group One, Task Three

The ease of use bins for the ideas generated by group one for task three are displayed in Figure 14. As stated before the ideas are ordered within the bins from the highest to the lowest number of votes. The reason for the ordering is to identify the ideas the group members determined were the most important requirements for system to have.

All the bins for the individual groups are ordered this way. The functionality bins are display in Figure 15. Some of the same data items appear in the functionality bins as the ease of use as the conceptual model suggests this interaction. The next section displays the data from group one performing task four.

Ease of Use Bins		
Physical Effort	Mental Effort	Easy to Learn
Widespread access 62		Context sensitive help 6
Automatic update 31		
Hyperlink supplements, tables, forms, etc. 20		
Print ability 8		
Update control 5		

Figure 14. Ease of Use Bins for Group 1, Task 3

Group One, Task Four

This section contains the data for the brainstorming session by group one for task four. The ideas categorized into the ease of use bins for the task are displayed in Figure 16. The functionality bins for the same task are displayed in Figure 17. The data are ordered as described earlier for the single group bins.

Functionality Bins			
Job Effectiveness		Productivity	
Widespread access	62	Smooth and Feasible implementation	13
Automatic update	31	Update control	5
Deployment capability	20	Electronic update	0
Centralization	16		
Update process routed on-line	16		
Date of publication and changes on directory	13		
POC for errors	11		
Print ability	8		
Joint operability	8		
Access control system	7		
Hyperlink	5		

Figure 15. Functionality Bins for Group 1, Task 3

Ease of Use Bins					
Physical Effort		Mental Effort		Easy to Learn	
Automatic citation for text cut and pasted	30	Search history	22	Natural language or advance search	22
Word search	23	Hit count	12	On-line help	14
Search by publication name and number	23				
Mark/print sections	21				
Hypertext	18				
Phrase search	17				
Wild card search	14				

Figure 16. Ease of Use Bins for Group 1, Task 4

Functionality Bins			
Job Effectiveness		Productivity	
Search delimiters	32	Personalized bookmarks	4
Automatic citation of text used	30		
Word search	23		
Search by publication name and number	23		
Natural language or advance search	22		
Phrase search	17		
On-line help	14		
Wild card search	14		
Hit count	12		

Figure 17. Functionality Bins for Group 1, Task 4

Group Two, Task Two

Task two for group two had similar results as it did for group one. Although, it was not quite as successful with two of the members not participating much in the task. This didn't affect the overall group discussion as all were involved in the other tasks they were asked to perform.

Group Two, Task Three

This section contains the data for the brainstorming session by group two for task three. The ideas categorized into the ease of use bins for the task are displayed in Figure 18. The functionality bins for the same task are displayed in Figure 19. The data, as in the previous section, are ordered as described earlier for the single group bins.

Group Two, Task Four

This section contains the data for the brainstorming session by group two for task four. The process was the same as the previous three sections for the single group bins. The ease of use bins for the ideas brainstormed by group two for task four are displayed in Figure 20. The functionality bins for the task are displayed in Figure 21. The single group displays will help to create the combined group bins discussed in the next two sections.

Ease of Use Bins		
Physical Effort	Mental Effort	Easy to Learn
Search capability 25	User friendly 50	Context sensitive help 6
Navigation 15	Access to OPR 17	
Incorporate supplements 15	User preference history 0	
Broad access 10		
Preview ability 7		
Hyperlink 5		
No additional programs needed 5		

Figure 18. Ease of Use Bins for Group 2, Task 3

All Groups, Task Three

This section and the next combines the data from both groups into a single set of ease of use and functionality bins for task three and four. In addition to sorting the data from highest to lowest vote totals, the ideas in the combined bins are also sorted into

clusters of related data. The ideas are sorted from highest to lowest vote totals first for the clusters of data, then the rest of the ideas are listed from the highest to lowest votes received. Figure 22 displays the combined ease of use bins with the data for both groups for task three.

Functionality Bins			
Job Effectiveness		Productivity	
Reliability	65	Preview ability	7
Search capability	25	Broken down into chapters	5
Access to OPR	17	Text version	2
Navigation	15		
Response time	15		
Incorporate supplements	15		
Broad access	10		
Hyperlink	5		
Backup system	0		
Publications management schedule	0		

Figure 19. Functionality Bins for Group 2, Task 3

Ease of Use Bins		
Physical Effort	Mental Effort	Easy to Learn
Search text by keyword 65	Search delimiters 10	Novice to expert search with tutorials for novices 35
Search index by keyword, subject, phrase, and publication number 60	Search history 5	Natural language search 20

Figure 20. Ease of Use Bins for Group 2, Task 4

Functionality Bins	
Job Effectiveness	Productivity
Search text for keywords 65	Search history 5
Search index by keyword, subject, publication number, etc. 60	
Search result 35	
Query as to OPR 20	
Search delimiters 10	
Hit count 0	
Search goes to specific point 0	

Figure 21. Functionality Bins for Group 2, Task 4

The task three data placed in functionality bins are displayed in same format in Figure 23. Accessibility and hyperlink are clusters which received votes from both groups under the physical effort category. No clusters were identified under the mental effort category. Two entries in the easy to learn bin formed a cluster with six and two votes for the idea. The same clusters from the physical effort bin are present in the job effectiveness bin under functionality. The rest of the ideas not in clusters follow in order from most to least votes.

Ease of Use Bins					
Physical Effort		Mental Effort		Easy to Learn	
Accessibility		User friendly	50	Help	
Widespread	62	Access to OPR	17	Context sensitive	6
Broad	10	User preference history	0	General	2
Hyperlink					
Various items	20				
General	5				
Control					
Version	12				
Update	5				
Automatic update	31				
Search capability	25				
Incorporate supplements	15				
Print ability	8				
Preview ability	7				
No additional programs needed	5				

Figure 22. Ease of Use Bins for All Groups, Task 3

Functionality Bins			
Job Effectiveness		Productivity	
Accessibility		Smooth and feasible implementation	13
Widespread	62	Preview ability	7
Broad	10	Broken down into chapters	5
Control system	7	Text version	2
Hyperlink		Electronic update	0
General capability	5		
General capability	5		
Reliability	65		
Automatic update	31		
Search capability	25		
Deployment capability	20		
Access to OPR	17		
Update process routed on-line	16		
Centralization	16		
Navigation	15		
Response time	15		
Incorporate supplements	15		
POC for errors	13		
Date of publication/change directory	11		
Print ability	8		
Joint operability	8		

Figure 23. Functionality Bins for All Groups, Task 3

All Groups, Task Four

The clustering and ordering techniques from the previous section were also used for the data gathered in task four in this section. The ease of use bins for this task are displayed in Figure 24. There are four clusters of data in this set of bins. Text search and index search form clusters in the physical effort bin, search history is a cluster under the mental effort bin, and a help function forms the last cluster under the easy to learn bin. The rest of the ideas are listed in order from most to least votes under the clusters. The functionality bins for the same task are displayed in Figure 25. The job effectiveness bin under functionality contains four clusters including the requirement to search the text, search the index, set search delimiters, and for the search result to provide a hit count.

Ease of Use Bins		
Physical Effort	**Mental Effort**	**Easy to Learn**
Search text	Search	Help
Keyword 65	History 22	Context sensitive 6
Word 23	History 5	General 2
Search index	Hit count 12	
Keyword, phrase, subject, and name and number of pub. 60	Search Delimiters 10	
By publication name and number 23		
Automatic citation 31		
Mark/print sections 21		
Hypertext 18		
Phrase 17		
Wild card 14		

Figure 24. Ease of Use Bins for All Groups, Task 4

Functionality Bins	
Job Effectiveness	**Productivity**
Search text	Search history 5
Text for keywords 65	Personalized bookmarks 4
Word 23	
Search index	
Forpublication name/number, keyword, subject 60	
By publication name and number 23	
Search	
Delimiters 32	
Delimiters 10	
Search result	
General result 35	
Hit count 12	
Hit count 0	
Natural language or advanced 22	
Query at to OPR 20	
Phrase 17	
Wild card 14	
Goes to specific point in document 0	

Figure 25. Functionality Bins for All Groups, Task 4

All Groups, Task Five

This section discusses the drawings and the discussion from the groups concerning the third investigative question, "What should the graphical interface for the on-line publications system look like?" Group one suggested the interface should look and work like the Windows the majority of AF users are already familiar. The researcher's representation of the screens they drew are shown in Figure 26. The first screen group one drew depicted the form to be used searching the system. The screen had a space for inputting the delimiters for the search with a pull-down menu to aid the process. The phrase, keyword, subject, or other search term had a blank to be input. There were buttons to provide the common functions the group expected the user to need.

The other screen the group drew was the display of a publication retrieved by the search. The screen displayed the name and number of the publication and a large section for viewing the text of the document. The top of the page contained buttons for performing the tasks the group expected to perform often. Examples of the common functions include: performing another search, change the text font, print, text only option, and help.

Group two had very similar screen formats as shown in Figure 27. The top of the screen included the designation as the official AF publications site. The search screen included blank areas to input the publication type to search, a format for the results, and the term to query upon. These input areas included pull-down menus for options to help the user perform the search. The screen also included some buttons for performing the

common options the user would need. The second screen this group drew was the actual result of the search. The text area represented the options that met the criteria of the search performed and the bottom included an option to perform the search again with narrower delimiters to reduce to number of hits from the first search.

Summary

The intention of the data display, according to Miles and Huberman (1984), is to provide a format for the data that fosters the researcher's understanding. Ordering and clustering are two techniques they suggest for organizing the data. These techniques have set the stage for drawing and verifying conclusions based on the data. Chapter V will detail the conclusion drawing and verifying for each investigative question, discuss the limitations of the research, and make suggestions for related research to be performed in the future.

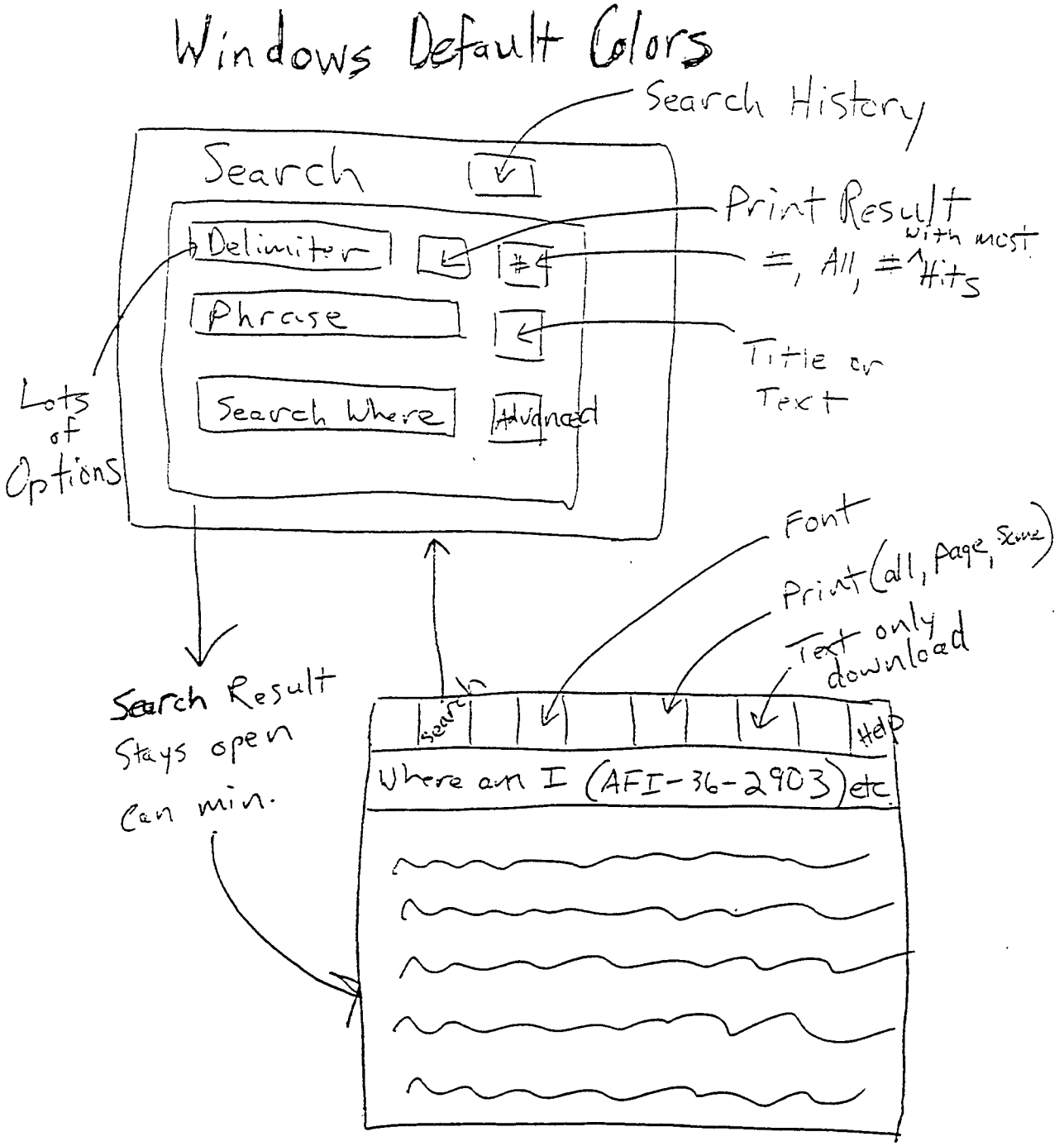


Figure 26. Group One, Task 5

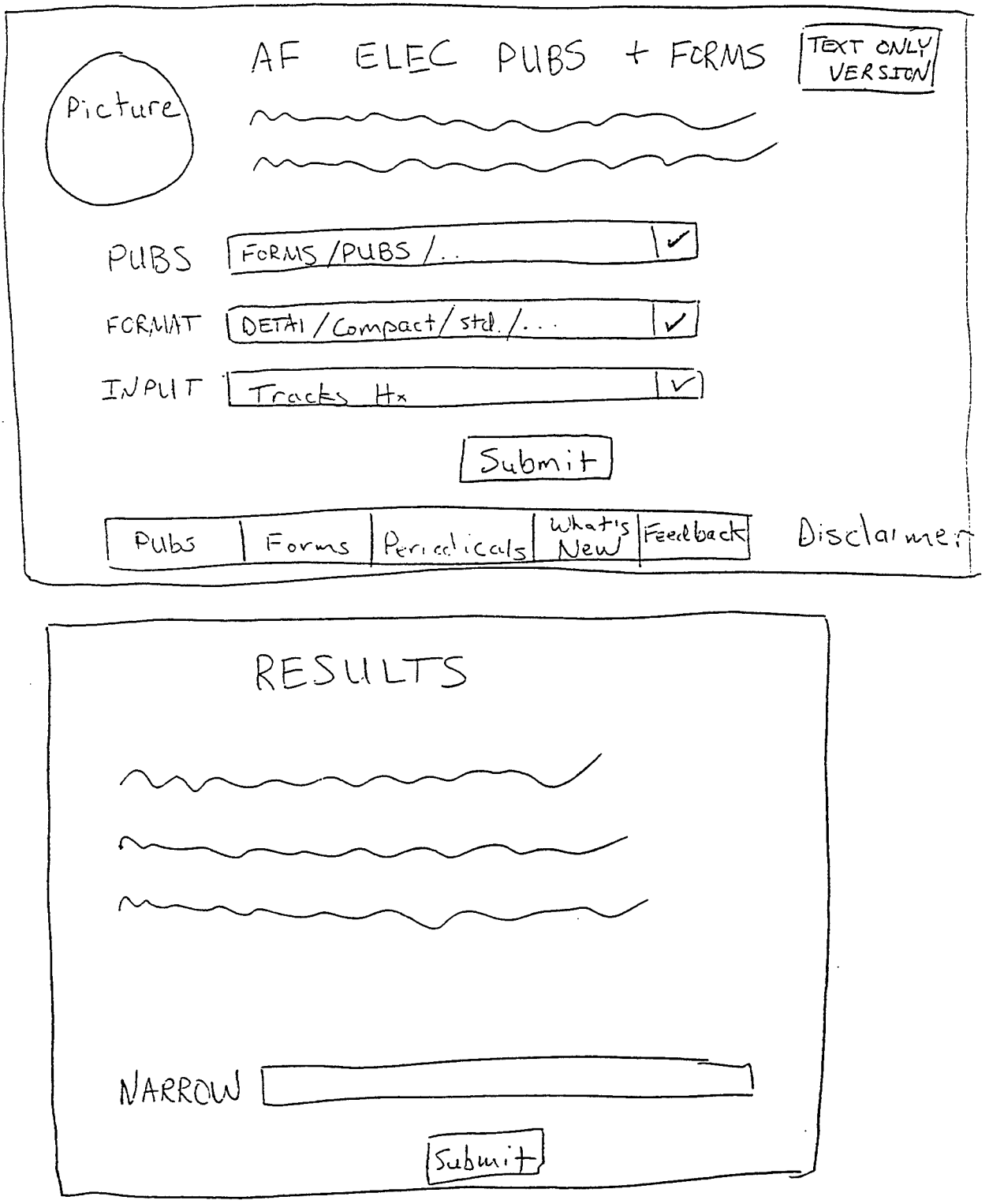


Figure 27. Group Two, Task 5

V. Conclusions and Recommendations

Introduction

The objective of the research effort as outlined in Chapter I was to answer the question, what can an on-line, electronic publishing system offer users to make the switch from the current system easier to deal with? This Chapter will address each of the investigative questions raised in Chapter I. In addition to answering the questions, the chapter will discuss the limitations the research experienced. The final section will discuss two areas for further research identified in this study.

Miles and Huberman (1984) recommend twelve different methods for drawing and verifying conclusions including: counting, noting patterns, seeing plausibility, clustering like items, making metaphors to generalize particulars, splitting variables, subsuming particulars into the general, factoring, noting relations between variables, finding intervening variables, building a logical chain of evidence, and making conceptual/theoretical coherence. The researcher determined patterns from the narrative of the two focus groups and verified or discounted the patterns from the text using the voting preferences of the groups.

Investigative Question One

The first investigative question posed in Chapter I was, "what functions the system should offer the user in terms of the work environment and/or the desktop environment?" There were several general functional areas the discussion centered around in the focus groups. This section will discuss these areas in detail except for the users' desire for a

search capability. The discussion of the search capability will be performed in the next section concerning investigative question two.

The first topic discussed by group one was the accessibility of the system to the users. The second group also determined accessibility as a key requirement for the system. In addition to the system accessibility, the second group added the requirement for a backup system to the accessibility idea. Group one supported the requirement for system accessibility with 62 votes as shown in Figure 15. Group two didn't discuss this topic first, and didn't provide as much support through the voting as Figure 19 shows the topic of broad access with only ten votes.

Group one discussed a set of functions that would be requirements due to the system being on-line. The functions include central update of changes by the OPR, routing of annual and special updates performed on-line, and a link to the OPR for questions. Group one supported these items with 31, 16, and 13 votes, respectively as shown in Figure 15. Group two had one similar suggestion for access to OPR with 17 votes assigned to it.

Both groups discussed the possibility of the hyperlink function for the proposed system. Group one put 20 votes for hyperlink of supplements, tables, forms, and other related materials as shown by Figure 14. Group two dedicated only five votes for a general hyperlink requirement. The number of votes for the hyperlink function didn't support the pattern established by the group discussions.

The highest vote total for a requirement for group two was 65 votes for system reliability. The other group didn't mention the topic as a requirement. The strength of conviction by group one supports the function as a valid requirement for the system.

The requirements recommended from task three in the procedure include the items introduced by both groups, and the ideas strongly supported by only one group. The clusters in Figures 22 and 23 show the requirements both groups supported and the strength of the support in votes. Accessibility mentioned by both groups and strongly supported by group one. The hyperlink cluster shows both groups support the idea, but with only 20 and 5 votes. The other cluster with both groups supporting a topic is the requirement for a help feature, but this wasn't well supported with only six and two votes. Some requirements received support from only one group, but the level of support from the single group suggests the feature is a requirement. System reliability received 65 votes from group two, automatic update of the publications received 31 votes from group one, deployment capability received 20 votes from group one, and access to the OPR received 17 votes from group two. Table four summarizes the requirements generated from task three of the focus group procedure.

Table 4. Task Three Requirements

Requirements From Both Groups	Requirements From One Group
Broad system accessibility Hyperlink capability On-line help	System reliability Changes automatically updated Deployment capability On-line access to OPR

Investigative Question Two

This section draws conclusions on the groups' ideas concerning the second investigative question, "on which types of items should the user be able to query the publication system: i.e. key terms, subject areas or other ideas?" Both focus groups determined a requirement for a search capability during the discussion of task three. The discussion of the specific requirements of the search capability were held for task four.

There were several strongly supported clusters, or items mentioned by both groups, in the combined group bins as shown in Figures 24 and 25. The first and most heavily supported was the requirement for the ability to search the text of the documents for a particular word. The groups supported the word search of the text with 65 and 23 votes. The next cluster supported the requirement for searching the index of the publications with 60 and 23 votes. The next most supported cluster gave 32 and 10 votes to the ability to use delimiters to narrow the scope of the search. The cluster under the mental effort bin in Figure 24 for a search history was supported with 22 and 5 votes. The lowest support for a cluster was twelve and zero votes for the requirement for a hit count. The ideas receiving significant votes from only one group included: 31 votes to have the system automatically put the citation on text cut and pasted to another program, 22 votes for the ability to use a natural language or advanced search, 21 votes for the ability to mark or print sections of the text, and 20 votes to the ability to query who is the OPR for a publication. Table five summarized the requirements generated from task four of the focus group procedure.

Table 5. Task Four Requirements

Requirements From Both Groups	Requirements From One Group
Word search of document text Search index of publications Use of delimiters to narrow search Maintain a search history Provide a hit count for word searches	Automatic citations Natural language search Mark or print sections of text Query for OPR

Investigative Question Three

The final investigative question posed the question, "what should the graphical interface for the on-line publications system look like?" Task five had the groups draw representations of the screens the system would use as the interface. Representations of the pictures drawn by groups two and three are included in Chapter IV. This task will draw conclusions from the groups' drawings from task five and from the discussion areas relevant to the subject of the interface.

Group one discussed the desire for the system to look like Windows or an Internet browser the users are familiar with from their work. They felt the need to learn a totally new interface would be a waste of time. Both groups' drawings supported this statement. The drawings support the assumption the proposed system should be based on the graphical interface common to the personal computer interfaces used throughout the Air Force.

Limitations

The researcher was not an expert facilitator in the focus group process. The use of the pilot study helped offset this limitation as it gave the researcher experience and allowed the fine-tuning of the procedure for the remaining groups. The focus group

methodology has advantages and disadvantages over participant observation and individual interviews, which are the data gathering techniques for which the focus group developed as an intermediate method. The focus group allows more data to be gathered in a shorter amount of time than the participant method, but moves the research to an artificial environment. This study is qualitative, concerning a proposed system, and the natural environment would not provide any different results for this research. The individual interview has an advantage as the researcher controls the flow of the interview and can organize the data for easier analysis. The researcher sought the interaction of the group members to allow the teamwork and creativity of the users to determine the requirements. In addition to the group interaction benefit, the researcher counted on Miles and Huberman's qualitative research model to help organize and draw conclusions about the data.

Recommendations For Future Research

During the course of the research process, the researcher identified two areas for future research that could lead to useful results. The researcher discussed in Chapter I the premise that providing publications on-line could provide productivity gains. The answer to this question could have broad impact on the push to move systems to the on-line mode. A relevant measure of productivity could help the cost justification effort for supporting the move to on-line systems.

Another research effort related to this study could entail using the results from this effort to produce and test a prototype system. The systems development life cycle supports prototype building as a next step in the process of developing the proposed on-

line publishing system. The model of the SDLC presented by Martin (1995) supports this as a next step as stage four in the model is system selection and phase five is preliminary design and system study.

Appendix A

Project Scope

The intention of the group session is to consider the possible look and feel of the on-line publications system of the future for the USAF. We'll generate ideas concerning the user interface and the possible functionality the system should have. We don't expect to come up the exact specifications for the entire system in the one and one half hour session. We can offer the system planners valuable input about the function, look, and feel of the proposed publishing system. The planners at HQ for publications have had little input from the users concerning the creation of an on-line publishing system. Input from the users should help foster user acceptance of the system as well as ensure the system offers the ability to meet the work needs they have.

Group Function:
Conceptualize an on-line publishing system for the USAF.

Tasks:

1. Complete personal information worksheet (3 min).

2. Creativity worksheet (5 min).

3. Consider and develop a list of the functions the system should offer the user in the work area and/or desktop (30 min).

4. Describe the types of items the user should be able to query the publication system: i.e. key terms, subject areas or other ideas (10 min).

5. Create a visual representation of the screen graphics, buttons and colors. Materials provided will include a flip chart and various colored markers (30 min).

6. Rank Order the Suggestions from task 3 and 4 (10 min).

Appendix B

Personal Information Worksheet

Gender ☐ Male ☐ Female

Military/Civilian Rank:_____.

Please enter your desired response to the following statements based on this scale:

Disagree ⟷ Agree

1 2 3 4 5 6 7

I consider myself experienced with the general use of computers. _____

I've experienced many different types of computer interfaces. _____

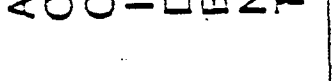
I'm an experienced user of USAF publications. _____

Appendix C

I.Q. TEST

Here are some real puzzlers for you! Decipher the hidden meaning of each set of words.

---

1 belt hitting	2 EXIT LEG	3 often not often not often	4 night fly
5 MIGRAINE	6 SPRING SUMMER AUTUMN WINTER	7 9ALL5	8 once upon a time N E S
9 GIVE GET GIVE GET GIVE GET GIVE GET	10 breth	11 	12 esroh riding
13 EMPLOY T MEN	14 wire just	15 GRIMY SMUDGED FILTHY BESMIRCHED UNWASHED FOUL SOILED TARNISHED UNCLEAN SOOTY SULLIED DUSTY	16 D012"OR

Answers

1. Hitting below the belt
2. Out on a limb
3. More often than not
4. Fly by night
5. A splitting headache
6. A man for all seasons
7. All in a day's work
8. Westside story
9. Forgive and forget
10. Short of breath
11. Accident prone
12. Horseback riding
13. Men out of work
14. Just under the wire
15. Dirty dozen
16. A foot in the door

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Vita

Captain Jefferey Thomas Hennes [redacted] He graduated from Fort Frye High School, Beverly, OH in June 1986. He graduated Cum Laude from Ohio University, Athens, OH in June 1990, receiving a B.B.A. with majors in Finance and Management Information Systems. He attended Air Force Officer Training School, Lackland AFB, TX and was commissioned as a 2nd Lieutenant on April 8, 1992. His first duty station was Pope AFB, NC, where he served as the Officer in Charge of the Orderly Room for the 2nd Airlift Squadron from April 1992 through January 1993 and Section Commander for the 23rd Supply Squadron from January 1993 through May 1995. He was then selected for the current assignment as a masters candidate in the Air Force Institute of Technology, Wright-Patterson AFB, OH in the Information Resource Management Program.

While stationed at Pope AFB, NC, he met and married the former Kimberly Ann Stuck. They were married on [redacted] 1994, and Captain Hennes has since adopted her three children, RJ, Whitney, and Ethan. The family has selected a house in Summerville, SC in preparation for Captain Hennes' assignment to the Communications Squadron at Charleston AFB, SC.

[redacted]

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13. ABSTRACT ***(Maximum 200 Words)***

This study investigated user requirements for an on-line system to distribute United States Air Force publications. Requirements were gathered utilizing focus groups of users from the students and staff of the Air Force Institute of Technology. The focus groups identified requirements for the system intended to foster its acceptance within the user community.

The conceptual framework posited user involvement in the design and implementation of the new system, providing a balance between functionality and ease of use fostering user acceptance. The framework was used to examine the relationships between the users involvement in the system design and implementation and its acceptance and use.

The conceptual framework and focus groups were used for gathering data about system requirements. The inputs from the focus groups were used to develop the suggested requirements for the system. The resulting system requirements fell into the following groups: system reliability, system accessibility, search capabilities, desktop options, and hyperlink capabilities.

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3. **Please estimate** what this research would have cost in terms of manpower and dollars if it had been accomplished under contract or if it had been done in-house.

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