AFIT/GIR/LAR/95D-5

DTIC
ELECTE
DEC 2 8 1995
S D
F

THE WAREHOUSE INFORMATION SYSTEM (WINS): AN ARCHITECTURAL DESIGN FOR AN INFORMATION SYSTEM EMPLOYING THE WORLD WIDE WEB TO ENHANCE FOREIGN MILITARY SALES (FMS) EXCESS INVENTORY MANAGEMENT

THESIS

Chad E. LeMaire, First Lieutenant, USAF

AFIT/GIR/LAR/95D-5

DTIC QUALITY INSPECTED 2

19951227 005

Approved for public release; distribution unlimited.

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 United States Government.

Accesion For	
NTIS CRA&I	☑
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and / or Special
A-1	

AFIT/GIR/LAR/95D-5

THE WAREHOUSE INFORMATION SYSTEM (WINS): AN ARCHITECTURAL DESIGN FOR AN INFORMATION SYSTEM EMPLOYING THE WORLD WIDE WEB TO ENHANCE FOREIGN MILITARY SALES (FMS) EXCESS INVENTORY MANAGEMENT

THESIS

Presented to the Faculty of the Graduate School of Logistics

and Acquisition Management of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Information Resource Management

Chad E. LeMaire
First Lieutenant, USAF

December 1995

Approved for public release; distribution unlimited.

Acknowledgments

I wish to first thank God for all He has given me. I also thank the members of the Dayton Church of Christ for showing me much love and compassion—by this, I know you are His disciples. The time here has proven to be exciting and challenging, but I'll leave here a better person than before—to God be the glory!

I wish to thank my sponsor Mr. Richard Brusky and the entire program management office for the Worldwide Warehouse. Without his dedication, guidance, and eagerness, the Warehouse as well as this thesis would not have been possible. The USAF could definitely use more people like Mr. Brusky.

I also wish to thank my advisor, Dr. Alan Heminger, and my reader, Lt Col Karen Currie. There were many trying times along the way, but Dr. Heminger was there to provide guidance that improved many faults in both this paper and my character. Lt Col Currie offered many great comments and helped guide this thesis when the "$64,000 question" was raised. These two make up the best thesis team for which any student could hope— their advice and patience turned an idea into reality, and a draft into a thesis.

Finally, I wish to acknowledge my love and gratitude to my beautiful wife, Suzanne, and my awesome children, Madison Elizabeth and Everett Michael. AFIT robbed much of our time together, but, as you were here for me, I will now be there for you. As Marty Brown sang, "You are the reason I wake up each day…In my wildest

dreams, never would I believe that you could love a man like me." I love and thank each of you.

Chad E. LeMaire

TABLE OF CONTENTS

Page

Acknowledgments iii

List of Figures vii

List of Tables viii

Abstract ix

I. Background and Statement of the Problem 1

Introduction 1

Advance 1: Electronic Data 2

Electronic Data Interchange (EDI) 2

Electronic Commerce (EC) 3

Advance 2: The Internet and the World Wide Web (WWW) 4

Setting for Thesis 5

Current FMS Requisition Procedures 5

Transfer Programs 6

The Worldwide Warehouse 7

Financial Transactions 9

Why Automation 11

Goals of the Warehouse 12

Key Features of the Warehouse 12

Scope 13

Problem Statement 13

Research Objective 16

Research Question 16

Overview of Thesis 17

II. Literature Review 18

Introduction 18

Electronic Data Interchange (EDI) 18
History of EDI. 20
The EDI Process. 21
Benefits Derived From EDI. 22

Electronic Commerce (EC) 24

Page

World Wide Web (WWW) 26

Integration of EDI and Electronic Commerce on the Internet 27
Security Concerns. 29

FMS Excess Materiel Return (FEMR) 31

Third Country Transfers (TCTs) 31

Project SHARE 32

Worldwide Warehouse: Previous Research 34
Quintero and Valadares. 34
Dyess and Stish. 35
Anderson. 37

Summary 39

III. Methodology 40

Overview 40

Qualitative Research 40

Systems Analysis and Design 42

Planning 42

Requirements Analysis 43

Design 44

Summary 44

IV. Planning, Analysis, and Design 45

Overview 45

Planning 45

Requirements and Analysis 46
Security. 47
Flow of Events. 47

Design 48
Initial Design. 48
The Warehouse's Compatibility With Project SHARE. 48
Final Design. 50
Detailed Flow of Events. 50
Attainment of WINS' Objectives 53
Summary 54

Page

V. Conclusions and Recommendations 56
Overview 56
Analysis 56
Discussion. 58
Limitations of the Research 59
Recommendations for Future Research 59
Summary 60
Appendix A: Servers and Browser 61
Hardware Server 61
Commerce Server. 61
Netscape Browser 62
Appendix B: Acronyms and Definitions 63
Bibliography 65
Vita 69

List of Figures

Figure Page

1: Worldwide Warehouse Flow 9

2: World Wide Warehouse Financial Flow 11

3: Diagram of WINS 17

4: Sussman and Evered's Qualitative Research Model 41

5: Integrated Warehouse and Project SHARE Systems 50

6: WINS Architecture 50

List of Tables

Table Page

1: Model Comparison 42

2: Initial Architecture 48

3: Architectural Parts and Features of WINS 51

4: Example Query Information 58

AFIT/GIR/LAR/95D-5

Abstract

The United States Government has long provided security assistance to foreign countries. Each year, billions of dollars of military hardware and equipment are sold through a process known as Foreign Military Sales (FMS). Unfortunately, most countries are now reporting that they are holding many items, sometimes billions of dollars worth, that are excess for their needs. At the same time, there are many countries in need of these items. Countries currently have two options for getting rid of the items—they can write them off or try to return them. Countries encounter problems with both of these choices. Naturally, if countries write off the items and destroy them, they lose the potential for selling the items. The two current return programs, Third Country Transfers and FMS Excess Materiel Return, have not provided a sufficient means for reducing and redistributing this excess. In response, the Air Force Security Assistance Center (AFSAC) has developed a program, the Worldwide Warehouse, specifically aimed at helping countries reduce their excess materiel. AFSAC wants to automate the features of the Worldwide Warehouse. This thesis provides an architectural design for an information system capable of automating the features of the Worldwide Warehouse.

THE WAREHOUSE INFORMATION SYSTEM (WINS): AN ARCHITECTURAL DESIGN FOR AN INFORMATION SYSTEM EMPLOYING THE WORLD WIDE WEB TO ENHANCE FOREIGN MILITARY SALES (FMS) EXCESS INVENTORY MANAGEMENT

I. Background and Statement of the Problem

Introduction

The United States Government has long been involved in foreign military sales (FMS) and security assistance. It has been reported that this is "one of the primary methods used to carry out foreign and national security policy" (DISAM, 1995). The Air Force Security Assistance Center (AFSAC) is the agency within the United States Air Force tasked with providing security assistance, mainly in the form of arms sales, to FMS countries.

AFSAC, like most organizations, is constantly looking for more effective and efficient ways of doing business. Two major advances, electronic data interchange/electronic commerce and the Internet/World Wide Web along with a new program known as the Worldwide Warehouse have the potential to dramatically affect the way the Air Force Security Assistance Center (AFSAC) conducts business for Foreign Military Sales (FMS).

Before describing the two advances in detail, it is first necessary to present the "traditional" approach to conducting business between two entities. Traditionally, organizations have mainly used paper as their means of exchanging information. Organizations may use computers to fill out these forms (such as billing invoices), but it

still takes time to print, prepare, and mail the information to the buying organizations. This is a time consuming and costly process for the organization mailing the invoice and also for the organization receiving the invoice. Receiving organizations must pay someone to reenter the information into their computers. As such, errors are sometimes made due to human imperfection.

Advance 1: Electronic Data

An advance which has aided organizations (such as AFSAC) is the ability to exchange electronic data (Biby, 1994; Emmelhainz, 1990; Jilovec, 1993; Crowley, 1993; Sokol, 1995). First, electronic data interchange (EDI) (Brawn, 1989; Crowley, 1993) was created to allow customer organizations to order directly from supplier organizations, by allowing their computers to "speak" directly to each other. It is a paperless process with little or no human intervention. More recently, electronic commerce (EC) (Sokol, 1995) has been used to allow organizations to sell their items and transfer financial information.

Electronic Data Interchange (EDI). Electronic Data Interchange (EDI) has revolutionized the way many businesses conduct business transactions. EDI works by formatting files in such a way that receiving computers can understand the message in the sending computer's file. Thus, the important information, such as how much of what item and when to ship can be readily determined. This information can then be sent to a distribution center, where the appropriate items can be picked and shipped, frequently with little or no human intervention.

From the slow process of manually filling out paperwork to the quick process of electronically submitting the information, EDI has increased the workload capacity of many organizations. Biby writes the following concerning EDI:

> EDI is a strategy. It requires the company to look ahead and recognize previously unforeseen opportunities. Those who implement EDI by their own volition as a strategic offensive will discover that EDI solves most of today's business tribulations: stagnating profits, uncontrollable operational expenses, brutal competition, low product quality and poor customer service. Those who wait until EDI implementation is a necessity literally risk losing control of their own destiny. (Biby, 1994)

Electronic Commerce (EC). While EDI has been around for several years and has proven itself to be valuable to the "corporate world," EC is a relatively new term which incorporates EDI and other facets of commerce. These facets include imaging, electronic catalogs, and security features among others. Changes with the Internet, specifically the development of the World Wide Web (WWW), have brought about the capability to conduct electronic commerce over the Internet.

To further explain EC, the IITA Task Group wrote the following:

> Electronic Commerce integrates communications, data management, and security services, to allow business applications within different organizations to automatically interchange information. Communication services transfer the information from the originator to the recipient. Data management services define the interchange format of the information. Security services authenticate the source of information, verify the integrity of the information received by the recipient, prevent disclosure of the information to unauthorized users, and verify that the information was received by the intended recipient. (IITA, 1994)

Advance 2: The Internet and the World Wide Web (WWW)

The second major advance is the capability of using the Internet and World Wide Web (WWW) for EDI/EC (Klein, 1995; IETF, 1995). Whereas organizations have had to use special leased lines between organizations, the Internet allows for organizations to be able to connect to any other organization hooked up to the Internet. A major advantage of this is that organizations do not have to pay an incremental cost per transaction—the cost is the same per month regardless of usage. At the time of this writing, this is the capstone in the a steady evolution in finding ways to improve an organization's ability to conduct business.

A client-server architecture is necessary to use the WWW. A server is "a system that supplies services [such as the ability to run applications or access files] to a client"...while a "client is a process that remotely accesses resources of a compute [sic] server" (Sun, 1995b). The server would need to have software capable of converting information. In the scenario of using WWW for EC, organization one would use a client to fill out a form and then submit it to organization two. Organization two would have software on its server to convert the data from form format to the appropriate format used by organization two. Organization two could also fill out forms which would be converted to the appropriate format before being sent to organization one. In this case, only the organization with the server would need the conversion software.

December and Randall write the following:

> The Internet, hypertext, and multimedia—three important technologies of the nineties. Bring them all together, and you have the World Wide Web (WWW)...

> The concept of hypertext is disarmingly simple: Use the computer's storage and searching capacity to link documents together and thus let users jump instantly from one piece of information to the next.
>
> A hypertext is a series of documents, each of which displays on the screen a visible link to at least one other document in the set. The link is usually highlighted...The user "navigates" through a hypertext by selecting these links...The link leads to another document, which in turn offers links to additional documents, and so on...
>
> The basic point about multimedia is simple: Barring physical disabilities, we experience the world as a combination of sensory perceptions. So if the world offers visual and auditory information, why can't computers?...For now, though, computing is restricted to the visual and audio capabilities offered by movies and television, and it's these two phenomena that multimedia computing is trying to take advantage of. (December and Randall, 1994)

Setting for Thesis

The combination of EDI/EC with Internet/WWW provided the setting for this thesis—the design of the Warehouse Information System (WINS) using the Internet/WWW to support the Worldwide Warehouse. The Worldwide Warehouse program, hereafter referred to as the "Warehouse," provides a means to decrease the excess stock of FMS customers. WINS will be designed to aid the Warehouse in offering FMS customers the capability to buy and sell surplus materiel to each other. To understand what this program and system offer, it will help to first examine the current system by which FMS customers order and obtain materiel from AFSAC.

Current FMS Requisition Procedures

As stated earlier the United States uses the FMS program as a means of aiding its national security. It involves the selling of arms to foreign countries. According to *The Economist* (1994), the United States, through both FMS and direct commercial sales, was

responsible for approximately $32 billion in military arms sales—70 percent of world market. This made the United States the number one supplier, in dollars, of military arms (*The Economist,* 1994).

When customers have a need for materiel, they create a requisition. A requisition is, for the most part, a purchase request. It contains information such as item requested, quantity, buyer address, and FMS account number. An AFSAC-designed, DOS-based application known as STARR-PC, or some other electronic means, is used to place a requisition. The requisition is routed to the Security Assistance Management Information System (SAMIS).

SAMIS is the information system set up to query DOD excess stock (an inventory of items declared excess by the DOD), then DOD wholesale stock ("normal" DOD inventory), and, finally, if neither place has the item, to inform AFSAC to start procurement procedures. SAMIS maintains a database that tracks and updates all FMS orders. SAMIS is also responsible for passing the financial information to the Defense Finance Accounting Service in Denver, where most, if not all, financial accounting takes place for FMS sales.

Transfer Programs

There are currently two programs in existence which foreign countries can use to get rid of/sell their excess inventory items. They are known as third country transfers (TCTs) and FMS Excess Materiel Return (FEMR). TCTs are between two foreign

governments while FEMRs are between one foreign government and the US Government.

According to Anderson (1995), "both programs...have been criticized by foreign governments and AFSAC alike because they [have not provided] a viable means to reduce stock levels." For TCTs, among other things, this is probably due the length of time it takes to obtain permission for the transfer. For FEMRs, it is probably due to the fact that it was originally set up to provide the USAF a means of obtaining materiel in short supply, not necessarily to provide a means for FMS customers to sell their excess inventories.

The Worldwide Warehouse

According to the SHARE pamphlet from the NATO Maintenance and Supply Agency (NAMSA):

> Reductions in defense budgets are a reality of today that all logisticians are faced with. Yet the military operators expect the same performance. The GULF war demonstrated that, besides the professional skills of the fighting soldier, logistics was the key ingredient for success. The challenge for the logistician, clearly and simply stated, is: '*the same or more, and better, with less*'...
>
> External influences and changing economic, military and political conditions have once again forced logisticians to rethink the very meaning of co-operation in order to maintain the superior edge that our military forces need, in spite of the necessity to do more with less money...Better use of available supply inventories that support the maintenance of our weapon systems is one area where there is much room for improvement. (NAMSA, 1995)

The Warehouse is defined as "a global electronic network established by the United States Government to redistribute internationally-owned, excess, spare parts and support

equipment which may be used to fill FMS requisitions." It will allow countries to requisition items declared excess by other countries. It will be a virtual warehouse in which a centralized database will contain a listing of items declared excess by FMS countries. Countries will be able to query the database to determine whether or not the needed item was in "stock". An item will be considered in stock if it is on the list of excess items from another country. If the item is in stock, the country can fill out a requisition for the item. Once the item is ordered, the Warehouse will send a letter to the seller requesting that they ship the item to an intransit inspection point (IIP). Upon receiving and inspecting the materiel, the IIP will then send the item to the buying country (Brusky, 1995).

As currently planned, unless specifically directed by the buying country to first use the Warehouse, SAMIS will use the following query procedure to fill FMS requisitions: DOD excess, Warehouse stock, and DOD wholesale stock. If none of the "stocks" have the item, it will be sent for procurement. FMS customers have the right to request that the Warehouse not be used. On the other hand, FMS customers also have the right to specifically request for the Warehouse to fill the order (Brusky, 1995).

The Warehouse will also allow for customers to know whether or not an item is in stock in the Warehouse since customers can query the database. If it is in stock customers can request that the item come from the Warehouse. As a result, buying countries will know immediately if the item is in stock, and therefore, that they should receive the item in approximately 30 days. Refer to Figure 1 for a graphical representation (Brusky, 1995).

Once it is determined that the requisition will be filled from the Warehouse, the following procedures will be followed:

1. A status message will be sent to the buying country informing them that the requisition will be filled by the Warehouse

2. The Warehouse will send an electronic message to the selling country, as well as a courtesy copy to the proper IIP, requesting the selling country to ship the item to the proper IIP

3. Upon receipt of the message, the seller will properly package the item and ship it to the IIP

4. The IIP will then perform an inspection on the item

5. Once the item passes inspection and all country markings are removed, it will then be transferred and shipped to the buying country

Refer to Figure 1 for a graphical representation (Brusky, 1995).

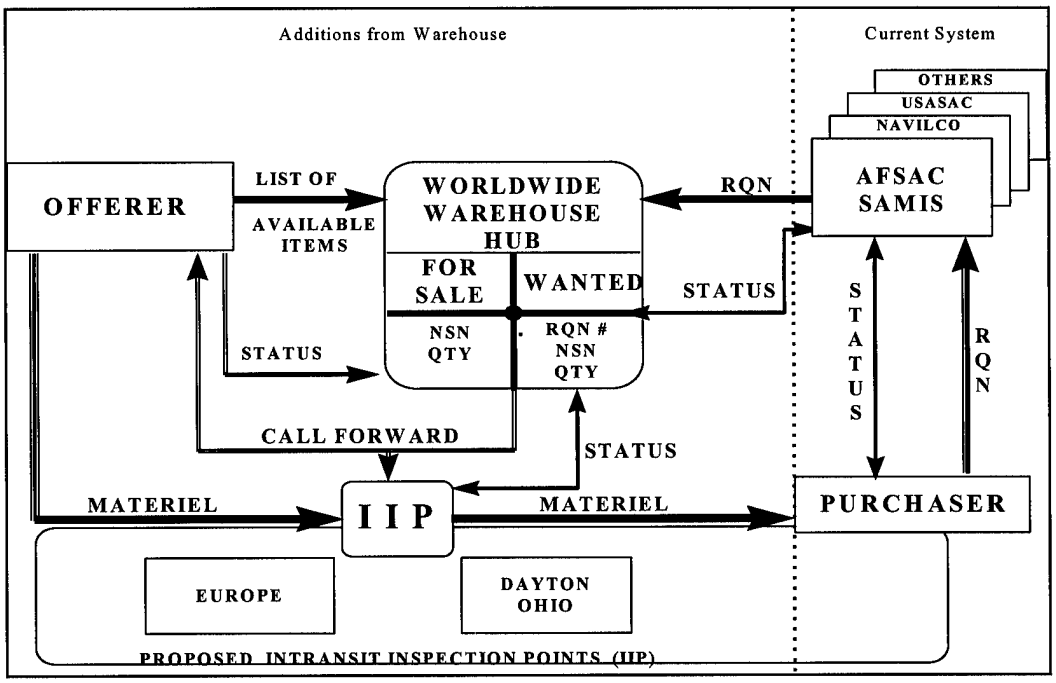

Figure 1: Worldwide Warehouse Flow

<u>Financial Transactions.</u> The following is how the financial transactions will

be handled for FMS customers. Once the requisition is filled, SAMIS will send a billing report to Defense Finance and Accounting Service in Denver (DFAS-DE). DFAS-DE will then send a bill out to the purchaser with the other quarterly bills. The money from the purchaser's trust fund will be send to a "cash register" account for the Warehouse. The Warehouse will then transfer the money to the buyers account. Next, the money will then be put into the countries "G" Case account. G Case accounts are used to keep account of services provided to FMS countries. From this account, 10 percent will be transferred into the cash register for the Warehouse. This 10 percent will be used to pay for the Warehouse's administrative costs including ADP, IIP, and personnel costs. Refer to Figure 2 for a graphical representation (Brusky, 1995).

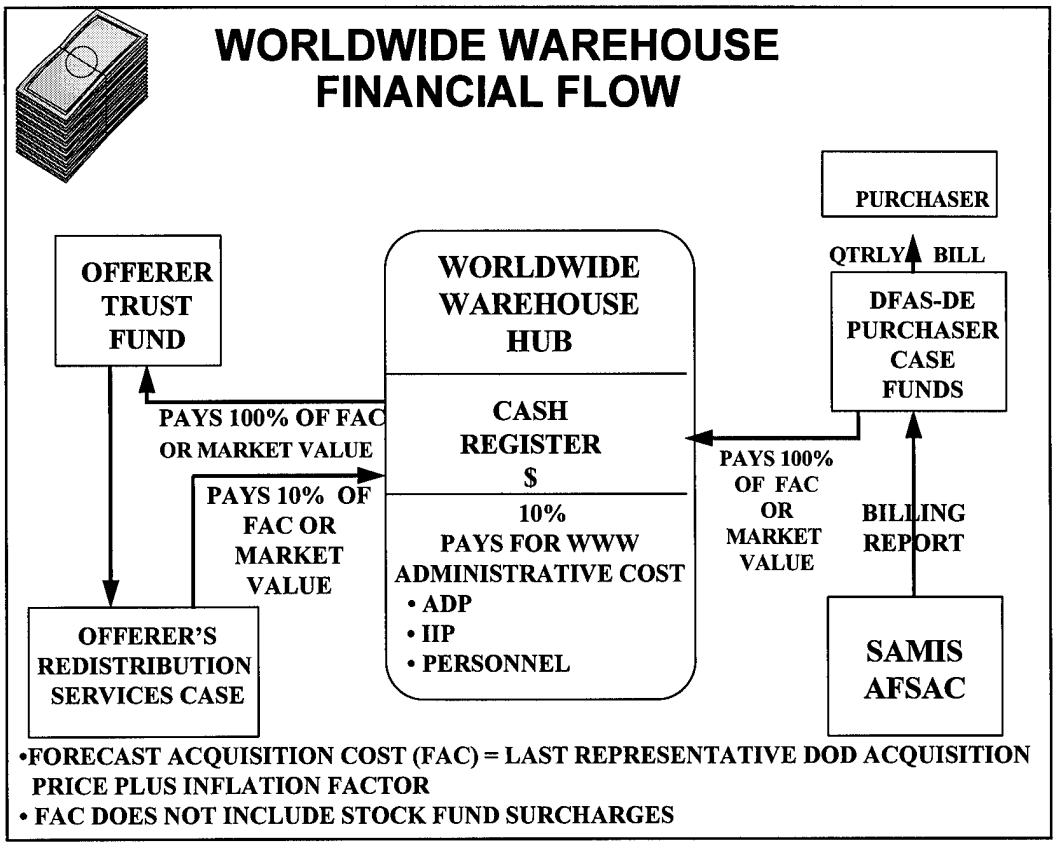

Figure 2: World Wide Warehouse Financial Flow

Why Automation. Due to the expected high volume of traffic, an automated system is planned. An information system is needed to handle the unique Warehouse procedures and also to communicate with SAMIS so the necessary financial information can be sent to DFAS-DE. The unique portions of the Warehouse include accessing a remote database listing FMS excess inventories and filling out an electronic form to place a requisition. Once the form is filled, it will then be converted into MILSTRIP (Military Standard Requisitioning and Issue Procedures, the military's proprietary EDI) format. From this point on, the existing infrastructure involving SAMIS will be used (Brusky, 1995).

AFSAC is also planning to exchange inventory data with NATO. To do this, AFSAC needs an electronic means of transferring this information. Countries participating both the Warehouse and Project SHARE, NATO's program, will receive information about each other's inventory. To make this happen, upon official approval to begin the Warehouse, there will be cooperation between the program offices of the Warehouse and Project SHARE.

Goals of the Warehouse. According to Brusky (1995), the Warehouse has three major goals:

- "Reduce material costs by at least 10 percent when (Warehouse) assets, instead of DOD stocks, are used to fill FMS (requirements)"
- Reduce the lead times of requisitions twenty-fold by using Warehouse assets instead of having to use government contracts
- "Reduce by 50 percent excess inventory held by FMS customers"

Key Features of the Warehouse. According to Brusky (1995), there are nine key features of the Warehouse.

1. A centralized database of excess supplies from FMS countries and the United States will be maintained by AFSAC
2. Excess supplies will be maintained by selling countries until the items are requisitioned by another country
3. United States Government does not ever own the material being shipped; however, the United States Government and the selling country will warrant the transfer of the title to the buying country
4. Selling and buying countries will not know each other's identity—identities will only be known by the program management office

5. "Material quality will be guaranteed to the same extent as current (US Government) shipments"—during the inspection process, material will be visually inspected, photographed, and recorded by its serial number

6. Existing FMS billing and requisitioning procedures will be used

7. The price of the item will be the item's forecast acquisition cost—this cost is less than the cost from the DOD stock list price; as a result, countries will save money by ordering from the Warehouse

8. Selling countries "will receive proceeds from [Warehouse] sales in their FMS trust fund account [the account used to pay for FMS deliveries]"

9. The Warehouse will charge a 10 percent fee for the redistribution service (Brusky, 1995)

Scope

The scope of the thesis will focus on the use of EDI, EC, and the WWW to enhance excess inventory management for AFSAC FMS customers. It will also explore how EDI, EC, and the WWW are changing the ways business is being conducted. This information will be used to create a design for an information system (WINS) to support the Warehouse program. Upon completion of the project, the goal is to have a viable design for WINS using the WWW to support electronic commerce.

Problem Statement

According to AFSAC, "foreign military customers have purchased millions of spare parts, repair parts, and support equipment from the Department of Defense (DOD). Many of those items have become excess to the needs of the owners." For instance, countries get an excess of obsolete items when they upgrade or change weapon systems. They must stock the excess items or write them off unless they can sell them. If countries

could sell these excess items, it would allow them to recapture part of their investment. This, then, would allow them to purchase other parts, upgrades, or weapon systems.

AFSAC analyzed a sample of excess inventory items from four FMS countries, and determined that many of the excess items could be used to fill current open or partially-filled requisitions of other countries. AFSAC also determined there are countries waiting for parts to be procured that could be received much quicker if the Warehouse were to be used (Brusky and Russillo, 1995).

Another problem with the current FMS system is that countries do not have the ability to query stock inventory before they place an order. This is a problem is because of the time difference between filling an order from stock or getting it through procurement. If an item is in stock, it takes approximately 30 days to fill and receive the order. If it is not in stock and has to be procured, it takes approximately 700 days to fill and receive the order (Brusky, 1995).

The big difference in days can be attributed to the procurement process. First, a bidding process must take place. Next, after award of the contract, the contractor may then need to set up assembly lines and/or other necessary equipment to make the items. Then, once the items are made, they need to be inspected to assure they are of the same quality and design of the previous parts. This can become a lengthy process taking an average of 700 days to complete.

Because of this problem, two financially related problems are created. The first problem is that countries are unable to maximize fiscal planning. If countries were able to know stock levels and delivery times, they could increase their buying power for each

fiscal year. This is because they will be able to determine the number of items to purchase during the current fiscal year. If they do not know when they will receive the item, countries are unable to effectively plan for the year. Take the example that a country uses 10 widgets per year. If they know many widgets are in stock, they may order only 10 for that year. If they do not know the supply level, they may have to order 20-30 to cover for the 700-day procurement time.

The second problem, in conjunction with the first, is that countries need more storage space for the excess items they have to buy to cover for potentially long procurement times. This not only takes up valuable warehouse space, but also costs extra money, in terms of labor and building costs, to stock and maintain additional warehouse space.

The Warehouse is designed to overcome the problems caused by the current system. For some of the items usually needing to be procured, the Warehouse will allow countries to simply buy from another country and receive the item in approximately 30 days. The Warehouse will also allow countries to query its database, and, thereby, let them know that an item is in stock and will be received in approximately 30 days.

The program manager has requested for this thesis to determine the architecture necessary for automating the features of the Warehouse. This is the specific problem area addressed in this thesis. This thesis will attempt to determine not only if it is possible to automate the features Warehouse, but also determine a specific architecture for it. By designing an information system (WINS) to support the features of the Warehouse, it should, in theory, solve the same problems.

Research Objective

The objective of this thesis is to design WINS, an information system that will employ the WWW to conduct secure electronic commerce in support of the Warehouse. Along with the Warehouse features, the following is a list of expected benefits/features of implementing WINS:

- A graphical, user-friendly, aesthetically-pleasing interface
- An easy understandable format for the end-user to use
- Secure electronic commerce
- By interacting with databases, less human errors will be made
- Organizations with servers could easily persuade other organizations to become buyers/sellers due to a low barrier to entry—beyond the cost of connecting to the Internet, other organizations need only browser software which handles forms
- Once an organization is hooked up to the Internet, it will have the necessary data communication link necessary for conducting business with another organization—also, there is no incremental cost per transmission
- Only one translator is needed
- Organizations can remotely update their information contained in a database

Research Question

For WINS to be implemented properly, it will need to have several features built into it. It should provide for security, EDI (using MILSTRIP), EC (communicating with SAMIS, and, therefore, DFAS-DE), and remote query and order capability (using the WWW). Any system designed must account for these key capabilities. Refer to Figure 3 for a diagram of the Warehouse.

There is one question that must be answered in order to determine if the objective of this thesis can be achieved:

- In the architectural design of WINS, is it possible to employ the WWW to conduct secure EDI/EC?

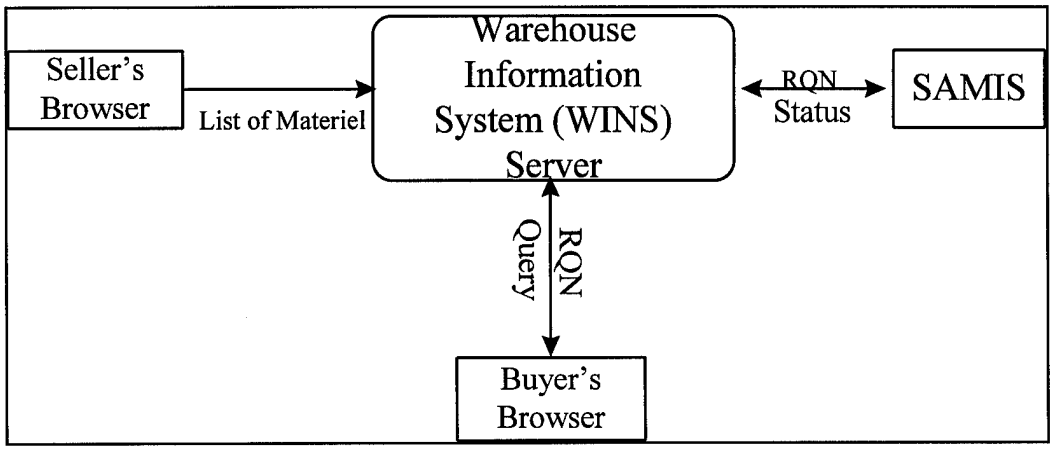

Figure 3: Diagram of WINS

Overview of Thesis

This thesis concentrates on the architectural design and design process for WINS. As such, there must be an understanding of the Warehouse goals and objectives, EDI/EC principles, and systems development. The purpose of the research is to explore these areas and to be able to design an information system capable of automating the features of the Warehouse.

Chapter I presented an overview of the Warehouse along with current ways to electronically exchange data. Next, Chapter II will describe current literature related to the thesis. Then, Chapter III will present the methodology used for achieving the objective set forth in this chapter. Afterward, Chapter IV will present the results of the methodology. Finally, Chapter V will include recommendations/conclusions drawn from the results and discuss the answers to the questions posed in this chapter.

II. Literature Review

Introduction

The Worldwide Warehouse would be an alternative to two current FMS return programs, third country transfers (TFTs) and FMS Excess Materiel Return (FEMR), which would need to incorporate certain facets of EDI and EC. Both of the return programs have flaws in achieving the purposes set out by the Warehouse. The Warehouse is a program that would provide similar services as provided by NATO's Project SHARE. Even though the Warehouse is yet to be formally approved, several theses have been accomplished on various aspects of the program—from inspection standards to customers' perspectives to inventory levels. As such, this chapter focuses on a variety of topics, all of which are important to gain an understanding of the Warehouse.

In recent years, two advances involving the exchange of electronic data have aided the cooperation between buyer and seller organizations; they are EDI and EC. Similarly, advances in network capability, such as the Internet and WWW, have aided the interaction between organizations. All of these advances play a role in, and have been brought together, providing the basis for the design set forth in this thesis. In the following section, each of these will be explored in detail.

Electronic Data Interchange (EDI)

There are many definitions given for EDI, but they are all very similar. Biby (1994) defines EDI as "the electronic (computer) exchange of business data, using a

nationally approved data format, between the two companies." SITPRO (1989) defines EDI as "the replacement of the paper documents used in administration, commerce and transport by electronic messages conveyed from one computer to another without the need for human intervention." Ferguson and Hill define EDI as

> the movement of business data electronically between or within firms in a structured, computer processable data format that permits data to be transferred without rekeying from a computer supported business application in one location to a computer supported business application in another location. (Ferguson and Hill, 1989)

There are other articles which give very similar definitions for EDI (Coathup, 1988; Rochester, 1989; Emmelhainz, 1990; Jilovec, 1993; Crowley, 1993; Sokol, 1995). As such, all state or imply the electronic transfer of information from one system to another.

Brawn (1989) defines EDI more narrowly. He has four main points in defining EDI. First, the communication must be from application-to-application rather than just computer-to-computer. Second, an electronic transmission medium such as a value-added network (VAN) must be used. Third, electronic mail should be used for "store and collect/store and forward". Fourth, the messages transferred must be structured and formatted in an agreed upon standard, preferably an international standard.

One great attribute of EDI is its ability to be combined with other systems like electronic funds transfer (EFT). EDI along with EFT can lead to not only the exchange of goods, but also the exchange of payments. Several terms have been given to this type of transaction. Terms range from financial EDI (Hill and Ferguson, 1987; Canright, 1988; Cafiero, 1989) to corporate application systems (Svinicki, 1988; Wilmot 1988).

McNurlin (1987) reported that there are three common characteristics of applications which can greatly benefit from EDI:

1. A large number of transactions are involved
2. Accurate and precise reporting is necessary
3. Where it will aid customers by making it easier to purchase supplies

History of EDI. Brawn (1989) and Crowley (1993) trace the roots of EDI to the Berlin Airlift in 1948. Then, EDI was a "complex network of telex, radio-teletype, and telephone, along with some very overworked clerks in the logistics offices" (Crowley, 1993). This was a very crude implementation at best. The modern EDI movement, according to McNurlin (1987), Emmelhainz (1990), Biby (1994), and others, began with the United States Transportation Data Coordinating Committee (TDCC). It was formed in 1968 and helped develop translation rules for the four standard formats in effect at the time. The translation rules would allow for one format of EDI to be converted into a second format. This would allow two organizations, who have different EDI formats, to electronically exchange data.

One of the major contributions to the field of EDI came with the development of the ANSI X12 standard. This standard eventually replaced the TDCC standards. The United Kingdom's Department of Customs and Excise and the British Simplification of Trade Procedures Board (SITPRO) were also developing standards for international trade. The term chosen for this set of standards was "Tradacoms". The United Nations Economic Commission for Europe used the Tradacoms as the basis for developing General-purpose Trade Data Interchange (GTDI) standards (Schatz, 1988).

The differences between ANSI X12 and GTDI caused incompatibility between the two standards. The United Nations Joint European and North American (UN-JEDI) then started developing an international standard to be used by all nations. The standard has been labeled as the Electronic Data Interchange for Administration, Commerce, and Transport (EDIFACT). Carter (1989) reported that as of 1989 only two documents were completed, but many more were to be due out in the next five years. It appears that the process is going well, because as Sokol (1995) reports, "there are over 100 messages in various stages of development and over 80 already approved and being used."

Emmelhainz (1990) reports that according to Dennis McGinnis, a former member of the North America EDIFACT Board, "X12 is becoming, in effect, a subset of the EDIFACT standard, with EDIFACT providing all of the X12 data requirements." Emmelhainz also states "According to McGinnis...a movement from the X12 standard to the EDIFACT standard by a user will 'require some effort' but should not be extremely traumatic."

The EDI Process. The following, as taken from Jilovec (1993), is a typical EDI process. According to Jilovec, the process has these 13 steps:

1. Buyer inputs order into computer and a purchase order is generated
2. Interface software program ensures error-free document and directs "the order data into predefined EDI intermediate files"
3. Intermediate files contain information in a manner that translation software can read
4. Translation software formats data into EDI standards
5. Electronic document is now in a "predefined, recognizable order"
6. Communication software add necessary protocol information
7. A modem and telephone line are used to transmit document
8. Supplier's communication software receives document using specified protocol and converts protocols "to open the...document"

9. Purchase order is in a format recognizable by supplier
10. Supplier's computer converts from EDI to intermediate file
11. Intermediate file has the translated purchase information
12. Interface program ensures error-free document
13. Supplier can now process the order

Crowley (1993) has also defined steps in the EDI process. His version has only 10 steps. For the most part, they are the same as Jilovec's. The differences are the Crowley leaves off/merges the descriptions of step 5, step 6, step 9, and step 11. Also, for step 7 (step 6 in Crowley's model), there are several connections from which to choose. There can be a direct connection between the two companies or a value-added network (VAN) can be used. A VAN is a third party which handles transferring information between the two companies via an electronic mailbox.

Benefits Derived From EDI. EDI brings many benefits to an organization. One of which is cheaper transaction costs. Biby reports the following:

> According to a recent study by INPUT, a leading technology research firm, the average cost to generate, handle, store, and send a single paper purchase order is $50! The same study illustrated that an EDI purchase order costs just $4.90. That's a savings of over 90% in administrative costs. And it's faster and error-free. (Biby, 1994)

Another benefit is its ability to "source" an item for its cheapest cost from several suppliers. The following four benefits are reported by Emmelhainz (1990) and Biby (1994):

1. EDI eliminates errors that occur with paper transactions--errors such as illegible handwriting and/or manual data entry

2. Costs are lessened or even possibly eliminated for "expenditures on forms, postage, reproduction, storage, and administrative overhead such as filing and retrieval"

3. Customer service can be improved because of the information available

4. Relationships between trading partners can also be improved--this, in itself, can lead to more business opportunities

Sokol (1995) reports the intracompany flow of data is improved. Crowley (1993) states that the company can limit its staff growth and increase productivity. This is, in essence, the saying of "do more with less."

According to Biby, the following is a list of benefits of EDI:

- Eliminates manual preparation and transfer of paper documents
- Increases amount of information available and accessible
- Increases data accuracy
- Streamlines operations
- Reduces paper costs, storage requirements, and handling overhead
- Improves product delivery
- Improves customer service
- Provides a competitive advantage
- Improves quality of products and services
- Eliminates need for large inventory levels
- Improves quality of products and services
- Reduces operating costs
- Improves relationships with suppliers and customers
- Improves data security
- Reduces order lead times
- Creates better procedures
- Improves cash flow

As with most systems, there are several challenges for EDI implementation. Jilovec (1993) lists, in her terms, "the 11 biggest challenges for implementing EDI." They are as follows:

- Gaining management commitment
- Managing changes to business processes
- Learning new technology and methodology
- Dealing with standards
- Selecting the hardware platform
- Maintaining dual systems
- Selecting communications support
- Determining appropriate applications
- Managing Security and auditability
- Addressing legal issues
- Implementing multiple trading partners

Electronic Commerce (EC)

While EDI has typically been a one-to-one relationship between organizations, EC is mainly one-to-many. Sokol (1995) defines electronic commerce as "the sharing of information using a wide variety of different electronic technologies, between organizations doing business with one another." According to Sokol, there are several messages associated with electronic commerce. They are EDI, electronic messages, electronic forms, imaging, direct access to trading partner databases, and electronic catalogs. Electronic messages include e-mail and fax. They are usually person-to-person, but can be computer-to-computer or a mixture of the two. Electronic forms provide structure and can provide a "behind-the-scenes conversion to EDI." Imaging includes graphics and is being used as a marketing technique. Direct access, "the ultimate in service," can be used by a vendor to determine an order for the customer. Electronic catalogs/bulletin boards allow the viewing and downloading of data (Sokol, 1995).

Kalakota (1995) reports that electronic commerce as can be broadly described as "a modern business methodology that addresses the need felt by organizations, merchants and consumers alike to cut costs while, at the same time, improving the quality of goods and services, and increasing the speed of service delivery." Kalakota goes on to report that "more commonly, however, [EC] is associated with the buying and selling of information, products, and services via computer networks."

According to the IITF CAT (1995), the following items can be supported by EC: electronic funds transfer, government regulatory data interchanges, collaborative

engineering, enterprise integration, and computer-supported collaborative work. It also states that EC involves more than just business transactions. It states that ideas and opinions can be exchanged and information can be amassed and sorted.

The benefits of EC include all of those of EDI, with the addition of a few more benefits. According to the draft IITF CAT (1995), the following are benefits of EC:

- Reduced costs to buyers from increased competition in procurement
- Reduced errors, time, and overhead costs in information processing
- Reduced costs to suppliers
- Reduced time to complete business transactions
- Creation of and easier entry into new markets
- Better quality of goods due to standardization
- Faster time to market
- Reduced inventories
- Reduced overhead
- Reduced use of ecologically damaging materials

Stefan Klein (1995) reports that the Internet is becoming increasingly popular for businesses which are deciding to implement electronic commerce. He estimates that there are over 30 million Internet accounts. He also reports that "the recent proliferation of the World Wide Web...has not only increased the technical options for the exchange of messages but also the ease and joy of use."

Klein goes on to report that "with the advent of the [Web], the Internet has become a platform that more and more companies consider to use for electronic commerce." He also states that standards have been developed for including EDIFACT messages in the body of an electronic message. Also, the Web can be used as a user-friendly interface and front-end that can generate EDIFACT messages. Another major advantage is that the

EDI application is on the provider's system, and, as a result, "the customer only needs a WWW browser and Internet access" (Klein, 1995).

World Wide Web (WWW)

The concept of the WWW was thought of by Tim Bernes-Lee in March 1989. At that time, Mr. Bernes-Lee was working for Geneva's European Particle Physics Laboratory (CERN). He proposed "a hypertext system" in an effort to link information "among geographically separated teams of researchers in the High Energy Physics community." The WWW was designed as application that would use the Internet to link the participating teams (December & Randall, 1994).

In October 1990, "the project was presented anew," and several months later development of the first line browser was underway. The line browser is a browser that is capable of displaying only lines of text. The first use of the browser was in March 1991. "Essentially, 1992 was a developmental year." CERN made the browser available via "FTP". "In January 1993, 50 Web servers were in existence." It was in 1993 that "the first glimpse of the graphical, mouse-based hypertext system" was offered. Graphical browsers are those capable of supporting text and graphics and most of them are capable of supporting audio (December & Randall, 1994).

WWW traffic was only 0.1 percent of total Internet traffic in March 1993. This number increased tenfold, to 1 percent, in just six months. "That ten-fold increase became practically the norm for Web access increases, continuing into 1994" (December & Randall, 1994). According to a report written in April 1995 entitled "NSFNET Traffic

Distribution Highlights," WWW was the number one Internet application, accounting for more than 21 percent of Internet traffic (Merit, 1995).

Internauts (people who use the Internet) were able to view information, but businesses were still not able to conduct business via the Web because it was unsecure. Information such as credit card or bank account numbers could be sent over the Internet, but there was a possibility that someone could read this information. Then, in 1994, "work expanded on the development of 'secure' Web access, the kind of security needed if real corporate work were to take place across the Web, and if users were ever to provide such details as credit card information" (December & Randall, 1994).

Integration of EDI and Electronic Commerce on the Internet

According to Neeches *et al*

> We are on the verge of a new era in electronic commerce, where companies transact business spontaneously over the Internet... Buyers can browse multimedia catalogs, solicit bids and place orders...Connectivity is fading as the central issue in Electronic Commerce; it is virtually certain to be provided by the Internet... Some commonly expressed concerns include reliability, security, scalability, ease of use, and payment. Fortunately, solutions are in hand for these concerns [as]...technology is in hand to create an "industrial strength" Internet that complies with all of the requirements and safeguards mandated in procurement regulations. (Neeches *et al*, 1995)

The Internet Engineering Task Force (IETF) has a subgroup devoted to developing ways to conduct EDI over the Internet. In their Internet Draft "EDI Meets the Internet," the IETF-EDI list several benefits (some not yet implemented) that will occur when the Internet is used for EDI. They are as follows:

- Adoption of common standards and proven inter-operable systems

- Explicit commitment by participating organizations to meet required standards
- Layering of applications (such as EDI) over existing, proven applications
- Widely available public domain software including...applications (IETF, 1995)

Klein (1995) presents an interesting relationship between EDI and electronic commerce on the Internet. According to Klein, three perspectives must be distinguished. First, it is possible to use the Internet to transmit EDI messages. Klein even reports that standards have been developed to include EDIFACT messages in the body on an electronic message sent over the Internet. He even states that the transmission costs are much lower than the traditional method of VANs.

Second, it is possible to run an EDI application via the Web. This would provide:

> an easy to use interface for the customer and [generate] EDIFACT messages, e.g. orders or payment orders, transparently. The advantage of this solution is that the EDIFACT application actually [because of the underlying client-server architecture] resides at the provider's system, the customer only needs a WWW browser and Internet access. (Klein, 1995)

Neches *et al* (1995) support this viewpoint as they state "the next step is to combine current email forms packages and X12 formatters with World Wide Web facilities." CC EM3 (1995) also support this viewpoint as they state "with the advent of the World Wide Web, the Internet has become a platform that more and more companies consider to use for electronic commerce." They also take it one step further by stating "the...WWW for business needs to be specified and existing solutions like EDI *need* [italics added] to be integrated." This would also lower overall costs for customers and suppliers because the only software they would need to have is a browser. The third area, similar to the second, is that "EDI and WWW services can be seen as complimentary: while EDI focuses on

standardized business transactions, WWW applications focus on the transmission of multimedia information" (Klein, 1995).

Security Concerns. Larry Irving, Assistant Secretary for Communications and Information, National Telecommunications and Information Administration, Department of Commerce, stated "there are crucial needs for authentication of the source of the transaction, verification of the integrity of the transaction, prevention of disclosure of the transaction to unauthorized users, and verification of receipt of the transaction by the intended trading partner." This may be a concern, but Klein (1995) writes, "efficient security mechanisms are available by now and can be used for the transmission of sensitive information and the transfer of valuables [such as credit card numbers and bank account numbers]." The current focus of information on the Web is mainly on product and company information, but the future is very likely to include business transactions (Klein, 1995). Neeches *et al* (1995) state that "in short, privacy-enhanced mail and [secure browsers] neutralize reliability and security issues in using the Internet. In particular they eliminate...remote logins and exchanging passwords in the clear...and facilitate...business on the Internet."

The IETF-EDI also states that companies can encrypt messages "in a manner only the intended recipient can read...Digital signatures can also authenticate messages, preventing pranksters or rivals from submitting false orders." They also state that

electronic/digital "signature systems are better than existing paper based authentication and forgery detection technology" (IETF-EDI, 1995).

Several secure servers capable of supporting electronic commerce are available. Netscape Communications Corporation, a leading manufacturer of secure electronic commerce servers and browsers, has released Netsite Commerce Server 1.1. It "relies on encryption technology developed by RSA Data Security, Inc. It will help customers build secure servers that can authenticate customers and protect their data." Netscape has also incorporated its own Secure Sockets Layer (SSL) protocol to help "deliver secure transaction solutions that provide better security once data is sent...out onto the Internet" (Doyle, 1995).

Sun Microsystems, Inc. has announced they are "offering four key requirements for conducting electronic commerce over the Internet: access, security, publishing and infrastructure." Sun will release Netra Internet Server which will include "World Wide Web server software." To aid in the security,

> Sun will roll out a high-end firewall and management platform called Sunscreen, with a rich set of network access controls and encryption and authentication features that enable corporations to create virtual private networks (VPN) between one or more locations for secure data communications.
>
> By encrypting the data traffic between sites, businesses can ensure their messages and documents are protected, while saving on the high costs of using private leased lines for secure communication. (Rodriguez, 1995)

FMS Excess Materiel Return (FEMR)

As previously mentioned, the FEMR program is one way that FMS countries can sell excess materiel to the US. If acquired FMS items become excess, then "the customer may request permission to return them to [AFMC] stock and receive credit, using the FMS Excess Materiel Return (FEMR) program" (Change to AFM 67-1). The program was not necessarily set up to benefit foreign countries; instead, it was to provide USAF Item Managers (IMs) "an additional source of supply in the event that inventories became low and no other supply source was readily available" (Anderson, 1995).

This is not as simple as it appears on the surface. For the item to be considered for return, it must be "offered precisely when required for purchase by the item manager" (Dyess and Stish, 1994). As such, this requires the IM to be in a "buy" position. This buy position is the time between when the IM identifies a need and when (s)he submits a Purchase Request for the item (Quintero and Valadares, 1994) and typically lasts only a few weeks of each year (Dyess and Stish, 1994). "To make matters worse, if a submitted item to be returned is not accepted immediately when offered, the offer is discarded and never reconsidered by the [IM], even when he reaches his next buy position" (Anderson, 1995).

Third Country Transfers (TCTs)

If the US does not have a need for the items, the FMS country may sell their items through the TCT program. TCTs are defined as "the transfer of United States defense articles, services, and training to a country...from a country which originally acquired

such items from the [US]." Countries cannot perform this on their own because, when they buy military items from the US, they sign a Letter of Offer and Agreement (LOA). As part of the LOA, countries agree not to sell the materiel to other foreign countries unless permission has been obtained from the US President (this duty has been delegated to the Department of State) (DISAM, 1995).

There are several problems associated with the TCTs. First as Quintero and Valadares (1994) reported that the process could take up to nearly 10 months to complete. Anderson (1995) reports that this "extended time delay is a major reason why the TCT program fails to meet the FMS customer's needs." The second problem with TCTs is "the lack of US government assistance in brokering these transfers" (Dyess and Stish, 1994). The third problem, according to Anderson (1995), is that the TCT program was not designed for "simple spare material"—it was designed "for the transfer of major defense equipment (e.g. aircraft, ships, armored vehicles)." This problem occurs because countries must follow the rigorous set of rules and regulations that apply to the major systems.

Project SHARE

The North Atlantic Treaty Organization (NATO) has a program entitled Project SHARE (Stock Holding and Asset Requirements Exchange) which provides NATO with services similar to those of the Warehouse. Its intent is to provide a means of transferring a country's excess materiel to another country in need of the materiel. AFSAC would

like for the Warehouse information system to be compatible with NATO's Project SHARE. Project SHARE provides countries with

> a logistic support capability that, on the one hand, provides NATO users with a means of automatically screening material asset availability NATO-wide, to satisfy urgent or routine, existing or future requirements, and, on the other hand, provides the participants in the logistics stock exchange with the means of reporting material asset availability for potential redistribution. (NAMSA, 1995)

The system has three basic elements: an on-line database, a query capability, and a capability of the participant to submit future requirements. The on-line database will be a centralized database to which countries can record available excess material. Countries will be able to query the database to check for the availability of a certain item. For Project SHARE, countries will be able to "submit future requirements that [it] may wish to record for purposes of consolidation during an agreed period of time."

The information system used for Project SHARE will be automated. Countries will be able to report excess material through remote means. They will be able to submit a "single line" or "batch mode" entry for updating the database. Standard formats will be used for submitting requests for excess inventory. The information system will automatically handle the requests and also send status messages to the buying country. Once a selling country has been chosen, the system will automatically inform the seller to redistribute the material. Again, the buyer will be informed automatically of this situation. One important factor of the information system is that it will "maintain the capability to communicate MILSTRIP transactions" (NAMSA, 1995).

Worldwide Warehouse: Previous Research

Several theses have already been written on different aspects of the Warehouse. In 1994, two theses were accomplished. The first, accomplished by Dyess and Stish, described the inspection process that would occur at the intransit inspection points. The second, accomplished by Quintero & Valadares, described customers' perspectives toward the Warehouse. Another thesis, written in 1995 by Anderson, described the potential affect of the Warehouse on excess inventories.

Quintero and Valadares. Quintero and Valadares (1994) examined three main questions: (1) Were customers aware of the magnitude of the problem of excess inventories and would they consider participating with the Warehouse as a viable solution?; (2) Were they satisfied with the Warehouse as proposed?; and (3) What are the suggested changes? (Quintero and Valadares, 1994).

For question one, the authors reported that countries were aware of the excess inventory problem. They approximated the excess inventory to be somewhere between $1 billion and $5 billion. Most countries were willing to participate in the Warehouse as a means of getting rid of their excess, but some countries were forbidden, by law, from selling military items. The Warehouse fared much better than FEMR and TCT as countries were typically displeased with the latter two operations (Quintero and Valadares, 1994).

For question two, the Quintero and Valadares reported that, overall, customers were satisfied with the current proposal for the Warehouse. "However, some of the actual

characteristics are not to the entire satisfaction of the potential customer." This questions was divided into 3 aspects. The first was "rules and administrative procedures and customer requirements and desires." Customers showed strong support for the proposed anonymity for Warehouse transactions. They were somewhat concerned with the pricing policy and query order (as the Warehouse stock was always going to be used last). The second aspect was that of quality assurance. Quintero and Valadares (1994) initially thought it was "a factor we foresee as fundamental for [Warehouse] success," but "customers [did] not show an [sic] specific position or tendency in this aspect." The third aspect dealt with the database to be used. For this "no difficulties are foreseen in this area as the system in the way proposed by AFSAC seems to be matching customers' expectations" (Quintero and Valadares, 1994).

For question 3, the authors wanted to know if there were any features that "could eventually be implemented...to improve the program." Customers thought that unserviceable material should be included and repaired before delivery. They felt that the Internet would be a useful data link for accessing the database (as will be implemented in the current system). Also, some countries would like to see an "expedite service" (Quintero and Valadares, 1994).

Dyess and Stish. The second thesis was accomplished by Dyess and Stish (1994). The main brunt of the thesis concerned itself with applicability of the international quality inspection procedures known as ISO 9000 to the Warehouse. Two of the objectives were to "(1) assess the ramifications of placing ISO 9000 at the core of a

quality program; [and] (2) investigate whether ISO 9000 can be implemented to ensure high quality products flowing through the Worldwide Warehouse" (Dyess and Stish, 1994).

For objective one, the authors found that ISO 9000 procedures were not interpreted the same worldwide. They state that the rules are very general which causes "confusion and ambiguity in interpretation among international auditing agencies...[and it is] not likely to be resolved in the near future." Another problem is that accreditation procedures are not standardized. Therefore, "how can it be expected that nations mutually recognize the certifications granted by others?" The authors suggest that putting ISO 9000 procedures at the core of the "quality control" would be a politically difficult decision. This is because AFSAC may have to "mandate that only government depot certifications obtained through a particular accreditor or auditor be employed" (Dyess and Stish, 1994).

For objective two, the authors raised the following question: "Can ISO certification ensure quality in and of itself?" Dyess and Stish state, "while product defects frequently decrease after ISO 9000's implementation, this cannot wholly be attributed to the standard." The authors report that it is aided by "the clarity, correctness, and completeness of its companion specifications." In essence, ISO 9000 must be used in conjunction with other specifications, such as technical orders, in order to be effective. Since most FMS purchases include warehousing and repair specifications, it may be possible to implement a quality inspection process using ISO 9000 procedures; however,

"the value added by requiring Worldwide Warehouse subscribers to achieve ISO certification seems minimal" (Dyess and Stish, 1994).

Overall, due to the trouble associated with both the lack of agreement of auditing process and the length of time to get certified (sometimes several years), the authors suggest that ISO 9000 should not be at the core of the Warehouse inspection process. "When weighed against the pain which is necessary to achieve certification, along with the confusion and uncertainty which surrounds the standard, one would be hard-pressed to say that the value added is worth the requisite costs." The authors conclude by bluntly stating, "ISO 9000 and the Worldwide Warehouse are simply not ready for one another" (Dyess and Stish, 1994).

Anderson. The third thesis was accomplished by Anderson (1995). The focus of the thesis was on "comparing excess inventories against requisitions" to determine the number of requisitions in existence today that could be filled with excess inventories. Using a sample of 12 countries for his research, Anderson addressed three main questions in his research.

The first question was "over the past ten years [1984 to 1994], what has been the general trend of FMS requisitions that could have been satisfied by the excess inventories, and what has been the approximate dollar value of these satisfied requisitions?" Anderson reported that there was a general decline in the number of FMS requisitions that could have been filled by the excess stocks of the 12 countries (Anderson, 1995).

Anderson offered several explanations for this decline. The first possibility is overall FMS requisitions may have decreased over this time span—possibly linked to declining defense budgets worldwide. The second possibility is some of the excess items offered may have become obsolete over time (Anderson, 1995).

Question two, as stated by Anderson, was, "measured by the prospective sales of excess inventory, which countries [from the initial 12] might immediately benefit the most from selling excess material through the [Warehouse]?" Anderson used "percentage decrease in the total dollar amount of excess inventory" to determine the "benefit." From the excess list received from foreign countries, nearly $1.8 billion of excess inventory was identified. Of this amount, approximately $75 million (4 percent) could be filled by current open or partially shipped orders (Anderson, 1995).

Due to the nature of the list, country names were not given; however, three countries, B, G, and J were listed as the three countries that could receive the most from sales revenue. Together, these three countries accounted for nearly 88 percent of the $75 million. "Country B alone, with its $41.4 million in potential immediate sales, could satisfy 56% of the total dollar value of immediately redistributable excess stock." Even though B and J were the two largest "holders of excess material...the immediate reduction of excess inventory for these two countries was just 6 and 3 percent respectively" (Anderson, 1995).

Question three was, "what is [the] estimated net monetary return for nations that sell excess inventory?" As mentioned in the opening chapter of this thesis, countries would

be charged a service fee equal to 10 percent of the sale amount. Another cost countries would encounter is shipping costs. Anderson posed this question to potentially "forecast the estimated net monetary return to sellers of excess material once shipping costs...and [Warehouse] surcharges were deducted from the gross sale amount." The average net return per country ranged from 45 to 90 percent with an overall average net return of 76 percent (Anderson, 1995).

Summary

This chapter presented a review of literature related to this thesis. An extensive background and history was presented on EDI because WINS will have to incorporate some form of EDI. Next, because it initially perceived that WINS will also incorporate EC, information concerning EC was presented. Afterward, information about the WWW was presented because it is a rapidly growing area that can and has been used for conducting EDI/EC over the Internet.

The remaining sections were concerned with information more specific to the program side of the Warehouse. Current transfer methods, along with their negative aspects, were identified. Next, a program entitled Project SHARE, which conducts similar services as the Warehouse, was discussed. Finally, three theses, describing different aspects of the Warehouse, were presented.

III. Methodology

Overview

This chapter describes the methodology accomplished in this thesis. First, the qualitative nature of the research will be given. Next, a model will be presented that describes steps for collecting data for this type of research. Finally, the author will provide a description of how these steps can be compared and joined with the stages of systems analysis and design.

Qualitative Research

Due to the nature of the research, the data gathered will be qualitative, not quantitative, in nature. As Schmitt and Klimoski (1991) summed up, "qualitative research is more an approach than a particular design or set of techniques...'doing description' is therefore the fundamental act of qualitative research."

Schmitt and Klimoski discuss one type of qualitative researchers who state that "it's not the techniques that define an approach, it's the kind of intellectual effort it represents." They report the following concerning the previous statement.

> This different attitude toward research by those who take a qualitative approach has been characterized in a slightly different manner by Evered and Louis (1981). They describe such individuals as conducting organizational research from the "inside." In contrast to the usual natural science paradigm, this involves taking an active or participative role in the behavior to be investigated...We gain knowledge this way...In practice, proponents of this view would argue that our hypothesis and the ways we categorize information should result from our experiences rather than be proposed in detail ahead of time.

> Traditional inquiry from the outside would stress the discovery of generalized statements that are universally applicable. In contrast, inquiry from the inside is directed toward creating a complete description of the specific case. The researcher is seeking a rich appreciation for the context and the conditions operating at that point in time. (Schmitt and Klimoski, 1991)

Therefore the methodology used will be like that described above. There will not be a formulation of any hypothesis with which to test. Instead, it will present a study of the effort to determine information system requirements for the automated system to be used with the Warehouse. Figure 4, from Sussman and Evered (1978), shows a graphic display of the process.

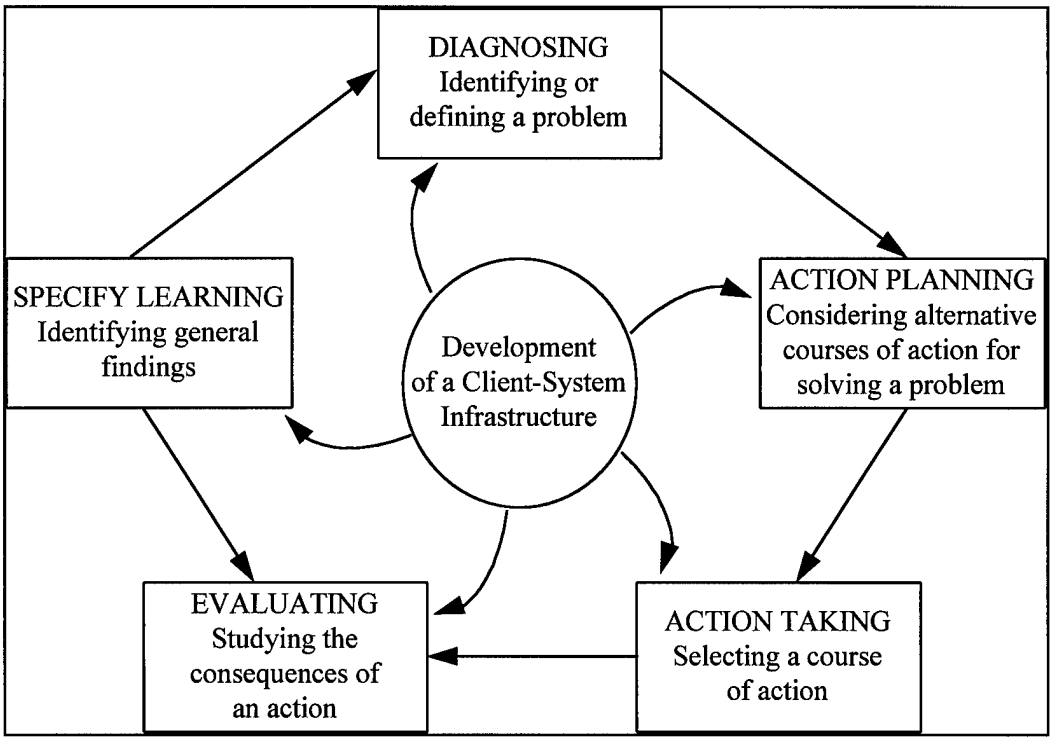

Figure 4: Sussman and Evered's Qualitative Research Model

Systems Analysis and Design

The qualitative steps will be accomplished in conjunction with the stages of systems analysis and design (SAD). There are several proposed ways for accomplishing the traditional SAD processes of initial study/planning, analysis, design, and operate and maintain. For this endeavor, the author decided to pursue the steps as described by Kendall and Kendall (1995). The steps of SAD used are termed "identifying problems, opportunities and objectives" (planning), "determining information requirements" (requirements), "analyzing system needs" (analysis), and "designing the recommended system" (design) (Kendall and Kendall, 1995).

Refer to Table 1 for a comparison of the two models used for this study. Because this study will end at the design stage, the later stages of SAD will not be incorporated into the model; however, both "evaluating" and "specify learning" will be accomplished in the thesis as the author will evaluate the study and discuss specific incidences of learning.

Table 1: Model Comparison

Stage	Sussman and Evered	Kendall and Kendall
1	Diagnosing	Planning
2	Action Planning	Requirements and Analysis
3	Action Taking	Design

Planning

The first stage is planning. Kendall and Kendall (1995) report that this stage "requires that the analyst look honestly at what is occurring in a business." In this stage, problems are pinpointed. They can be used to define opportunities as situations which

"can be improved through the use of computerized information systems." When identifying objectives the analyst will find out "what the business is trying to do." From this the analyst can determine "if some aspect of information systems applications can help the business reach its objectives by addressing specific problems or objectives."

In this stage, a background investigation will be accomplished on pertinent matters relating to the Warehouse. From this investigation, problems, objectives and opportunities will be identified. Within the investigation, a literature review of the Warehouse will be conducted to understand the concepts necessary for carrying out its function. Once a through understanding has been gained concerning the planning stage, the author will then proceed to stage two.

Requirements Analysis

The second stage is a combination of determining information requirements and system needs. In the requirements portion, the analyst strives "to understand what information users need to perform their jobs." The analyst needs to know the functions of the current system. Answers need to be determined for who, what, when, where, and how. The investigation will lead to answers for "who uses the system," "what information/system is used for the process," "when do customers use it," and "how do they use the system."

The second half of this stage is analysis. Kendall and Kendall (1995) describe the events in analysis as involving "analyzing system needs,...structured decisions,...(and) multiple-criteria decisions." Within the second stage, a requirements analysis will be

accomplished. This will include determining the requirements of the architecture. The completion of this stage will lead to the beginning of the third stage.

Design

The third stage is design. Kendall and Kendall (1995) describe this stage as using "information collected earlier to accomplish the logical design of the information system." In this stage a determination will be made concerning the different parts of the architecture (for example, determining a specific commercial-off-the-shelf software package or programming an in-house software package). It also involves "putting it all together." Upon completion of this stage, a completed logical design of an information system will be ready for physical design.

Summary

This chapter gave an overall description of the methodology to be used for this research effort. A description was given describing the type of data to be gathered. Next, a methodology was presented for gathering the data and developing an information system. The results attained from this methodology will be presented in Chapter IV.

IV. Planning, Analysis, and Design

Overview

As set forth in Chapter III, three stages of systems analysis and design were accomplished. The results obtained from the methodology provided the information necessary to determine the architectural design necessary to automate the features of the Warehouse. This chapter provides a description of the information obtained in each of the three stages.

Planning

Initial planning for the concept of the Worldwide Warehouse was initiated by Mr. Richard Brusky, AFSAC/XMOS. He undertook a task to explore ways to decrease excess inventories of AFSAC's FMS customers. This led to the design of the Warehouse. With this done, Mr. Brusky contacted Dr. Alan Heminger, Associate Professor, Information Resource Management at the Air Force Institute of Technology, for assistance with refining the program and designing an information system to support it. The author worked with Dr. Heminger to design WINS. An initial general design, utilizing the WWW, was presented to Mr. Brusky, who then requested that this thesis team act as his information system architects.

Chapters I and II presented much of the planning stage. Those chapters looked "honestly at what is occurring in a business" (Kendall and Kendall, 1995). Because the

Warehouse is not yet implemented, the thesis looked at what will occur. Problems associated with current FMS requisition and return programs were identified. From these problems, several opportunities, such as implementing the Warehouse and WINS, were identified. Lastly, the objectives of both the Warehouse and WINS were described. With this obtained information, it was time to proceed to the next step of analysis.

Requirements and Analysis

Because the Warehouse is not currently implemented, a system is not currently in use. Therefore, the author used information contained in the proposed program to determine the requirements and analysis for WINS. According to Kendall and Kendall (1995), answers to the following will be known upon completion of the information requirements portion of stage two: "who uses the system...what information/system is used for the process... when do customers use it...[and] how do they use the system."

The users of the system as defined in the program are FMS customers who want to either sell their excess inventory or buy materiel listed in the Warehouse stock. Under the proposed program, customers would browse the Warehouse inventory using the World Wide Web, but they would submit the order by using their current previously described electronic requisition system. For the initial design, the author foresees the possibility for countries to place an order using a form on the World Wide Web. In either situation, countries must know the following information before placing an order: national stock number (unique identifier of the item), quantity, upper limit on spending, FMS Case, routing code (countries could use this to direct SAMIS to first query the Warehouse stock

instead of DOD stock), and delivery information. The questions pertaining to when and how customers use the system are, in essence, the same for this situation. Customers use the system to create or check the status of an FMS requisition. Customers simply enter the appropriate information and submit it to SAMIS. SAMIS then returns the appropriate type of message back to the customer.

Security. For various reasons, the system designed will need to include some security measures. Several "layers" of security will be needed. The majority of the security features will be handled by the server software. A firewall will be needed to act as a medium between the Internet and the server. Server and client authentication as well as user authorization will be necessary. Data encryption and integrity will also be necessary. More detail will be provided in the final design section when I discuss how each step of the process will be handled.

Flow of Events. The Warehouse will need to support two separate flow of events. The first flow concerns ordering and delivering excess stock. The second flow concerns the financial transactions. The following is the typical flow for ordering using WINS:

1. Customer queries the Warehouse for an item
2. Customer receives feedback that the item is in stock
3. Customer creates order using a form from new system or using their current system
4. Order is converted into MILSTRIP format and sent to SAMIS with a code to take the item from the Warehouse
5. SAMIS queries the Warehouse for the item
6. Warehouse confirms to SAMIS that the item is in stock and forwards a status message to the customer
7. Warehouse sends a message to the seller (along with a courtesy copy to the IIP) requesting the seller ship the item to the IIP

8. IIP receives the item, performs ISO 9000 quality check, removes any country markings, and ships item to the buyer
9. Buyer receives the item

The flow for the financial transactions are as follows:

1. SAMIS sends a billing report to DFAS-DE
2. DFAS-DE sends a quarterly bill to the buyer
3. Buyer's CASE Fund is deducted for the total of the purchases
4. Amount is recorded in the cash register fund for the Warehouse
5. Money is transferred to the seller's trust fund
6. Money is sent to the seller's redistribution services (Warehouse) CASE Fund
7. Ten percent is sent to the Warehouse to cover administration costs.

Design

Initial Design. From the flow of events, an initial design architecture was designed. Refer to Table 2 for a description.

Table 2: Initial Architecture

Part	Feature
Centralized database	Store necessary materiel information
Secure server	Control and protect access to the database Allow buyers and sellers to access the database
Remote PCs and Front-end software	Capable of remote query
Connectivity	Connect centralized database and remote PCs; Connect centralized database (or remote PCs) to SAMIS
Conversion software	Convert form information into MILSTRIP format

Connectivity to the financial systems is not necessary because SAMIS is capable of passing financial information to the current financial infrastructure.

The Warehouse's Compatibility With Project SHARE. On 18 June 1995, during the meeting between Warehouse and SHARE program managers, several business

and ADP solutions were discussed. One of the issues was ADP compatibility. During the meeting, Project SHARE program manager Nico Oorebeek announced that NATO decided to use Lotus Notes as a solution for their front-end and server software.

As it turned out, the decision by NAMSA to use Lotus Notes helped the compatibility between the two systems. Since a preliminary architecture using Netscape's commerce server and along with a relational database (RDBMS) had been determined, the use of Lotus Notes provided for some compatibility between the two system's databases. Worse case, a translation program would need to be written to translate the information from Lotus Notes to RDBMS format. The databases are a key since this is where the queries are taking place. Also, even though NAMSA is not using the Internet as their data communications link for Project SHARE, they would be able to use it to link to WINS. This will be the vital link between Project SHARE and the Warehouse. Figure 5 details the relationship between Project SHARE and the Warehouse.

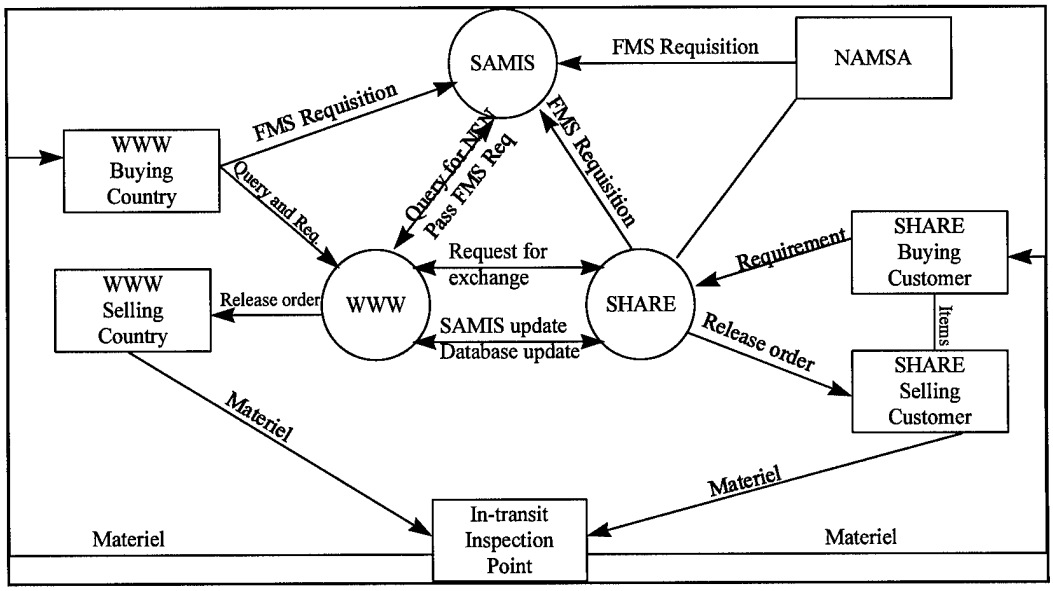

Figure 5: Integrated Warehouse and Project SHARE Systems

NAMSA officials also announced that they will not use EDIFACT for the transactions concerning Project SHARE. Project SHARE will still employ EDIFACT, but only for transmission to and from the NATO board. The use of EDIFACT is beyond the business dealing between the Warehouse and SHARE. The decision to not use EDIFACT as the EDI standard proved to be beneficial to both systems.

Final Design. The following, Figure 6, is the architecture of WINS:

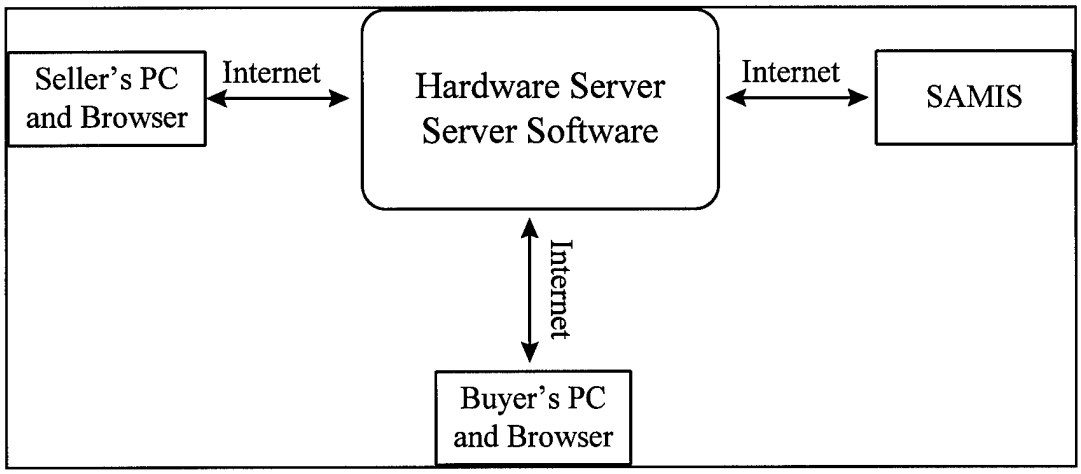

Figure 6: WINS Architecture

Refer to Table 3 for a description of WINS parts and features as well as current commercial software (COTS) capable of providing the features. Also, refer to Appendix A for a detailed description of the COTS servers and browser.

Detailed Flow of Events. Following Table 3 is a detailed flow of events describing the steps selling and buying countries will use when accessing WINS.

Table 3: Architectural Parts and Features of WINS

Design Part	Features Pertinent for WINS	COTS with Pertinent Features
Hardware Server	Firewall Email Server Authorization security features Secure Server	Sun's Netra Internet Server w/ Solaris OS
Server Software	Data Encryption and SSL security User authorization Server authentication Data integrity	Netscape's Commerce Server 1.1
PC Hardware	Platform for browser software	Any able to run a graphical browser
Browser	Email capability Server and client authentication Data encryption, integrity and SSL security	Netscape Navigator
Data Link	Widely accessible by a majority of clients	Internet
RDBMS	Support for CGI-scripts Capable of storing much information	Oracle or Sybase
CGI	Allows for querying of databases Allows for converting form to MILSTRIP	CGI Scripts

For Sellers:

- Seller starts browser software and enters address for WINS
- Hardware server verifies customer can access the server and the firewall allows information to flow

- Browser and server software authenticate each other and a secure line is achieved (from here on, all information is encrypted)
- Seller is prompted for and enters username and password—information is verified by server
- Seller receives homepage for WINS and selects "Sell"
- Seller enters pertinent information of item (NSN, quantity, etc.)

- CGI records information in RDBMS and confirms addition
- Seller can also query WINS for their excess listed for sale

For Buyers:

- Buyer starts browser software and enters address for WINS
- Hardware server verifies customer can access the server and the firewall allows information to flow
- Browser and server software authenticate each other and a secure line is achieved (from here on, all information is encrypted)
- Buyer is prompted for and enters username and password—information is verified by server
- Buyer receives homepage for WINS and selects "Buy/Browse"
- Buyer enters NSN of item where requested
- CGI queries RDBMS and RDBMS returns the query information
- Customer sees that the correct item is in stock and selects "order item"
- A form appears with all pertinent information filled-in
- Customer enters only delivery address and submits the information
- Server converts the form information into MILSTRIP format and sends it to SAMIS
- SAMIS receives requisition with routing code and queries WINS
- WINS verifies it will fill the requisition
- A message is sent to the selling country informing them to check their secure mailbox (in WINS)—a courtesy copy is also sent to the IIP
- Seller logs into WINS (using the same login procedure as described above) and opens their secure mailbox to receive the shipment information
- Seller replies to the message verifying that they will ship the items
- Update messages are sent from the IIP informing WINS of item arrival, inspection, and departure

- If buyer wishes, update messages can be sent to him/her
- Buyer can also query for a list of materiel bought

Attainment of WINS' Objectives

Following are the objectives of WINS listed in Chapter I along with a description of how this will be provided from WINS:

- A graphical, user-friendly, aesthetically-pleasing interface
- An easy understandable format for the end-user to use

The features and capabilities of the server and browser provide an appropriate means for attaining the above objectives.

- Secure electronic commerce

As described in Chapters II and IV, hardware servers, server software, firewalls, data encryption, authentication, and authorization to provide the necessary means for conducting secure commerce over the Internet.

- By interacting with databases, less human errors will be made

When a customer queries the RDBMS for items, the information returned from the database will be used to fill in the form if the customer decides to order. Because the information is coming from the database, (assuming the information was entered correctly in the database) the potential for transposing numbers, or other miscellaneous mistakes, is eliminated.

- Organizations with servers could easily persuade other organizations to become buyers/sellers due to a low barrier to entry—beyond the cost of connecting to the Internet, other organizations need only browser software which handles forms
- Once an organization is hooked up to the Internet, it will have the necessary data communication link necessary for conducting business with another organization—also, there is no incremental cost per transmission

- Only one translator is needed

The author considers these three benefits to be related. The main factor in all three is money. Many organizations are hooking/already hooked up to the Internet. Once "on the net," organizations do not have to spend much money to be able to conduct business with another organization that has a server. For transmissions, unlike leased lines, there is no charge for the amount of time an organization spends "using" the Internet—as previously stated, there are no incremental costs for transmissions. Depending on the number of browsers purchased, Netscape Navigators are $13 to $49 each. Whereas with the typical EDI approach requires both organizations to purchase translation software ($1000s), only one organization needs to have a translator for EDI using the WWW.

- Organizations could remotely update their information contained in a database

Using their browser and forms provided by server software, organizations can query databases to get a list of their items for sale. They can also use this process to create, read, update, or delete items they have listed for sale in the WINS database. This could also be used to create management reports that each country could receive via the WWW.

Summary

This chapter focused on the architectural design of WINS. The three stages of development used for this program (planning, requirements analysis, and design) were presented along with the information learned during each stage. The end result was an architectural design for WINS which will be capable of supporting the objectives/features of AFSAC's Worldwide Warehouse program.

V. Conclusions and Recommendations

Overview

This chapter presents the conclusions and recommendations from the research and serves to tie the thesis together. The answer to the research question will be presented. Afterward, the implications of the research will be described. Finally, recommendations for future research will be given.

Analysis

The question posed in Chapter I was, "In the architectural design of WINS, is it possible to employ the WWW to conduct secure EDI/EC?" The answer, as provided in Chapter IV, is yes. The following architectural features of WINS are those that will support the features of the Warehouse:

- A centralized database controlled by AFSAC and accessible by FMS customers worldwide
- Anonymity and secure communication features over the Internet for buying and selling countries
- Support for current FMS billing and requisitioning procedures through linkage to SAMIS

A centralized database of the excess materiel from selling countries will be maintained by AFSAC. Selling countries will be able to update their list of items for sale from a remote site using a browser and forms provided by the server. Buying countries will be able to browse the database and order materiel through WINS.

The anonymity feature will be supported by the database and security features as WINS will return only information such as national stock number, item name, quantity and price. The information will not contain the seller's identity. Because sellers receive an "order" message containing only information such as national stock number, item name, quantity to be shipped, price per item, and which intransit inspection point to ship the items, they will not know the identity of the buyer. Also, various security measures including data encryption, server and client authentication, firewalls, and authorization will ensure that the information will be readable only by the appropriate country. Therefore, AFSAC will be able to maintain a list of buyers, but neither the buyer nor seller will be allowed to know the identity of the other.

Customers will be able to use WINS in conjunction with their current system for requisitions in two ways. Customers will be able to look for items using WINS, and, upon confirmation that the item is in stock, they can use their current system to create the requisition. Customers may also look for and order items through WINS itself. WINS will communicate with SAMIS, and, through SAMIS's link to DFAS-DE, buying countries will be billed and selling countries will receive their money from the sale. This same connection will also be used to charge selling countries any applicable fee. As described, WINS will employ the WWW to conduct secure electronic commerce in support of the Warehouse.

Discussion

Recent advances in electronic data interchange, electronic commerce, Internet, and World Wide Web have expanded the capabilities of organizations. The WWW is a fast developing technology which has enabled and enhanced the interaction between EDI/EC and the Internet. As reported in Chapter II, the WWW is now the number one Internet application, in terms of traffic. Many users initially used the WWW out of "curiosity," but it is now a very popular medium used for a variety of purposes, including conducting business.

The WWW provides several features that will positively affect the Warehouse. One such feature is its ubiquitousness—it is available anywhere there is access to the Internet, which is rapidly moving toward global coverage and is already available in the majority of FMS countries. Thus, the communication infrastructure for most of the Warehouse's sales is already in place.

Another feature of the WWW is its ease of use, for both users and programmers. The Web supports graphical user interfaces which offers users "point and click" capability. For instance, the following is a hypothetical example of how buyers could purchase an item.

- Buyer receives homepage for WINS and selects "Buy/Browse"
- Upon receiving the buy page, the buyer enters "1" for the NSN and clicks "Submit"
- WINS returns the query information similar to Table 4

Table 4: Example Query Information

NSN	Part	Quantity	Price Per
1	Hand-held radio	45	$100

- Customer verifies the correct item is in stock and selects "order item"
- A form appears with all pertinent item information filled-in
- Customer enters only quantity wanted and delivery address and "submits" order

Thus, In just a few steps, the buyer is able to create an order with the Warehouse.

The WWW also provides programmers with an easy-to-use programming language. There is a standard language, hypertext markup language, for programmers to use. Also, it is possible to use other common programming languages, such as C++, for common gateway interfaces. This standardization and ability to use other common programming languages makes it very convenient for programmers to program for the Web.

Limitations of the Research

Due to time constraints, this research was not able to continue through the development and implementation stages. As a result, this effort was not able to assess the actual implementation. Also, the research concentrated on designing an architecture for WINS; it did not address specifics about the internal management system necessary to run the Warehouse.

Recommendations for Future Research

Due to the limitations of the research, there are still several areas which could be explored in future research. Just as Heminger (1989) explored the effectiveness, efficiency, and user acceptance of an operational group support system, research should be conducted in these areas for any new system, architecture, or technology. When WINS becomes operational., it is important to study the following areas:

1. Upon operational implementation, explore the effectiveness of WINS. The main question to be answered will be "Does WINS do the job?"

2. Upon operational implementation, explore the efficiency of WINS. The main question to be answered will be "Is WINS as, or more, efficient as any another means?"

3. Upon operational implementation, explore the user acceptance for WINS. The main question to be answered will be "Are users using it?"

Summary

This thesis concentrated on designing the architecture for an information system (WINS) utilizing the WWW to support the Warehouse in enhancing FMS customer's excess inventory management. The program manager requested that this thesis team determine an appropriate architectural design for an information system capable of automating the features of the Warehouse. The WWW is an area that appeared promising as a medium for conducting secure EDI/EC. The author explored the possibility of developing an architecture incorporating the WWW. The result was a design known as WINS—an information system capable of automating the features of the Warehouse. Simply stated, the union of the World Wide Web and Worldwide Warehouse is a match waiting to happen.

Appendix A: Servers and Browser

Hardware Server

Sun's Netra Internet Server with the Solaris Operating System was chosen. It comes with "preinstalled basic security to help protect the server from unauthorized or accidental access...making it invisible to users who don't have access permission" Sun also has Firewall-1 software to provide a firewall between the Internet and server. The hardware is a 110-MHz Sun SPARC-5. It comes standard with 2.1 gigabyte hard-drive (expandable to 57 gigs), 32 MB RAM (Expandable to 128 MB), 1.44 MB floppy drive, and a CD-Player. It also comes with NCSA Web server, Netscape's Communication Server, POP2 and POP3 (email capability), Telnet, FTP, PPP, and primary and secondary DNS server segments. (Sun, 1995).

Commerce Server

The server was designed as "high-performance server software for conducting secure electronic commerce and communications on the Internet and other TCP/IP-based networks." The server provides for "server authentication, data encryption, data integrity, and user authorization...Advanced security features are provided using the open SSL protocol". The following is a list, as taken from Netscape (1995), describing what SSL provides.

- Server authentication, which allows any SSL-compatible client to verify the identity of the server using a certificate and a digital signature

- Data encryption, which ensures the privacy of client/server communications by encrypting the data stream between the two entities
- Data integrity, which verifies that the contents of a message arrive at their destination in the same form as they were sent
- Employs public key cryptographic technology from RSA Data Security, an established leader in computer data security, and works with various encryption algorithms...requires a signed digital certificate to operate securely

Netscape Browser

Netscape's newest release (at the time of this writing) of their Web browser is Navigator 2.0. According to Netscape's data sheet for the Navigator, 75 percent of the browsers used on the Internet are Navigator Browsers. One major advancement with this version is that it "integrates fully functioned email." The Navigator also provides for security features as it allows for encryption, server and authentication, support for HTTP over SSL and SSL-based connection routing. (Netscape, 1995b)

Appendix B: Acronyms and Definitions

ADP: Automated Data Processing. (Ex: Computer systems).

AFSAC: Air Force Security Assistance Center. USAF agency tasked with overseeing security assistance and FMS sales.

ANSI: American National Standards Institute. Lead agency in the US for developing EDI standards.

ASC: Accredited Standards Committee. Committee within ANSI specifically tasked with overseeing the development of X12 standards.

DFAS-DE: Defense Financial Accounting Service - Denver. Agency responsible for billing FMS countries on a quarterly basis.

DISAM: Defense Institute of Security Assistance Management.

DLA: Defense Logistics Agency.

DoD: Department of Defense.

EC: Electronic commerce.

EDI: Electronic data interchange.

EDIFACT: Electronic data interchange for administration, commerce, and transportation.

EFT: Electronic Funds Transfer.

FMS: Foreign Military Sales.

IIP: Intransit Inspection Point.

Internet: Group of worldwide interconnecting networks.

MILSTRIP: Military Standard Requisitioning and Issue Procedures—a military proprietary EDI standard

NAMSA: NATO Maintenance and Supply Agency.

NATO: North Atlantic Treaty Organization.

Project SHARE: NAMSA project. Stock Holding and Asset Requirements Exchange.

SAMIS: Security Assistance Management Information System.

SDLC: System Development Life Cycle.

SHARE: See Project SHARE.

SITPRO: Simpler Trades Procedures Board.

TDCC: Transportation Data Coordinating Committee.

USAF: United States Air Force.

VAN: Value-added Network.

Warehouse: See Worldwide Warehouse:

Worldwide Warehouse: AFSAC project dedicated to improving FMS excess inventory management.

Worldwide Web (WWW): "Area" of the Internet that allows browsing documents. Also allows the "connecting" of documents using the hypertext transfer protocol.

X12: The EDI standard developed by ANSI.

Bibliography

Anderson, Jon D. *A Feasibility Analysis of the Worldwide Warehouse: Comparing Excess Inventories Against Requisitions.* MS thesis, AFIT/GAL/LAL/95S-1. School of Logistics and Acquisition Management, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1994.

"Arms Sales Boom," *The Economist*, August 13, 1994, 24-26. Author unknown.

Biby, Daniel J. *E-D-I or D-I-E: A Comprehensive Look at Electronic Data Interchange.* Cleveland OH: ADVANSTAR Communications, 1994.

Brawn, D. "EDI Developments Abroad and How They Impact on Australia," *Proc. IDC Conf. EDI--The Key to Profitability in the 1990s.* Sydney, Australia, 1989.

Brusky, Richard P. And V. Michael Russillo. *The Worldwide Warehouse: International Redistribution and Supply Services--Draft.* Air Force Security Assistance Center, Worldwide Warehouse Program Office, Wright-Patterson AFB OH, February 1995.

Brusky, Richard. *Concept Briefing.* AFSAC Briefing, Wright-Patterson AFB OH, April 1995.

Cafiero, W.G. "VANs, Not Banks, Best Suited to Deliver Remittance Data," *Corporate Cashflow*, April 1989, 34-38.

Canright, C. "Banks Seek EDI Opportunities," *Bank Administration*, April 1988, 40-41.

Carter, S. "Standards for EDI and Communications," *Proc. IIR Conf. Gain the Competitive Edge with EDI.* Sydney, Australia, May 1989.

Coathup, P. "Electronic Data Interchange," *Computer Bulletin*, June 1988, 15-17.

CC EM3. "CC EM3 - The Strategic Potential of Electronic Commerce," Http://www-iwi.unisg.ch/cc/em/em3proj.html. October 21, 1995.

Crowley, Robert T. *EDI, Charting A Course to The Future: a guide to understanding and using electronic data interchange.* Cary NC: Research Triangle Consultants, Inc., 1993.

December, John and Neil Randall. *The World Wide Web Unleashed.* Indianapolis IN:

Sams Publishing, 1994.

Defense Institute of Security Assistance Management (DISAM). *The Management of Security Assistance.* Wright-Patterson AFB OH. April 1995.

Department of the Air Force. *USAF Supply Manual.* AFM 67-1. Washington DC: HQ USAF, 11 Aug 1986.

Doyle, T.C. "It's No Longer Too Early to Get In," *VAR Business*, May, 1995, 54 as taken from CMP Publications Inc. Http://techweb.cmp.com/techweb/programs/-cmp_waisgate?RF=814654282.21156&num=1#head. October 25, 1995.

Dyess, Anthony T. and Henry E.E. Stish. *An Analysis of ISO 9000's Applicability to Worldwide Warehouse Quality Assurance.* MS thesis, AFIT/GLM/LAR/94S-13. School of Logistics and Acquisition Management, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1994 (AD-A285300).

Emmelhainz, Margaret A. *Electronic Data Interchange: A Total Management Guide.* New York NY: Van Nostrand Reinhold, 1990.

Ferguson, D.M. and N.C. Hill. "Electronic Data Interchange: A Definition and Perspective," *EDI Forum*, 1989, Volume 1, Number 1.

Heminger, Alan R. *Assessment of a Group Decision Support in a Field Setting.* Unpublished doctoral dissertation, University of Arizona, Tucson AZ, 1989

Information Infrastructure Task Force and the Committee on Applications and Technology (IITF CAT). *Electronic Commerce and the NII.* Draft for Public Comment. Http://iitfcat.nist.gov:94/doc/Electronic_Commerce.html. 1995.

Information Infrastructure Technology and Applications (IITA) Task Group. *Information Infrastructure Technology and Applications: Report of the IITA Task Group.* Http://www.hpcc.gov/reports/reports-nco/index.iita.html. February 1994.

Internet Engineering Task Force (IETF)-EDI Working Group. *EDI Meets the Internet.* Internet Draft. Draft-ietf-EDI-faq-01.txt. April 1995.

Irving, Larry. "Electronic Commerce: A New Way of Doing Business." Presented at Digital Commerce Conference. Washington DC. June 19, 1995. As taken from Http://www.ntia.doc.gov:70/00/speeches/liecom.txt. October 21, 1995.

Jilovec, Nahid M. *The A to Z of EDI: The Comprehensive Guide to Electronic Data*

Interchange. Beltsville MD: Computer Applications Specialists, Inc., 1993.

Kendall, Kenneth E. and Julie E. Kendall. *Systems Analysis and Design: Third Edition.* Englewood Cliffs NJ, Prentice-Hall, Inc., 1995.

Kalakota, Ravi. *The Frontiers of Electronic Commerce.* Http://cism.bus.utexas.edu/ravi/-book/C1.ps

Klein, Stefan. "The Strategic Potential of Electronic Commerce - An Introduction for Beginners," Http://www-iwi.unisg.ch/iwi4/cc/genpubs/ecintro.html. Institute for Information Management.

McNurlin, B.C. "The Rise of Co-operative Systems," *EDP Analyzer*, 1987, Volume 25, Number 6, 1-16.

NATO Maintenance and Supply Agency (NAMSA). *Stock Holding and Asset Requirements Exchange (SHARE).* Capellen, Grand Duchy of Luxembourg, 1995.

Neches, Robert, Anna-Lena Neches, Paul Postel, Jay M. Tenenbaum, and Robert Frank. *Electronic Commerce on the Internet.* Http://infor.broker.isi.edu/fast/ articles/EC-on-Internet.html. October 21, 1995.

Netscape Communications Corporation. *Netscape Commerce Server*. Http://home.-netscape.com/comprod/netscape_commerce.html. October 27, 1995.

Netscape Communications Corporation (b). *Netscape Navigator 2.0 Data Sheet.* Http://home.netscape.com/comprod/products/navigator/version2.0/datasheet.html. October 27, 1995.

"NSFNET Traffic Distribution Highlights" NIC.MERIT.EDU Ftp://nic.merit.edu/nsfnet/-statistics/1995/nsf-9504.highlights. April 1995.

Quintero, Hugo A. and Carlos A. Valadares. *Worldwide Warehouse: A Customer Perspective.* MS thesis, AFIT/GLM/LAL/94S-30. School of Logistics and Acquisition Management, Air Force Institute of Technology (AU), Wright-Patterson AFB OH, September 1994 (AD-A285020).

Rochester, J.B. "The Strategic Value of EDI," *I/S Analyzer*, 1989, Volume 27, Number 8.

Rodriguez, Karen. "Sun makes electronic commerce splash—Security, server and software product," *Interactive Age*, May, 1995, Issue 215, 8. As taken from CMP

Publications Inc. Http://techweb.cmp.com/techweb/programs/cmp_waisgate-?RF=814653390.19617&num=27#head. October 25, 1995.

Schatz, W. "EDI: Putting the Muscle in Commerce and Industry," *Datamation*, 1988, Volume 34, Number 6, 56-64.

Schmitt, N.W. and R.J. Klimoski. Research Methods in Human Resource Management. Cincinnati: Southwestern Publications, 1991.

SITPRO. *The EDIFACT Service from SITPRO*. London, England: SITPRO Board, 1989.

Sokol, Phyllis K. *From EDI to Electronic Commerce: A Business Initiative*. New York NY: McGraw-Hill, Inc., 1995.

Sun Microsystems, Inc. *Netra Internet Server*. Mountain View CA, 1995.

Sun Microsystems, Inc. (b). *Sun Glossary*, Http://www.sun.com/smcc/Products/-golssary.html. October 27, 1995.

Sussman, Gerald I. And Roger D. Evered. "An Assessment of the Scientific Merits of Action Research," *Administrative Science Quarterly*, 1978.

Svinicki, J. "Integrating EDI into the Second Supplier Tier," *Systems/3XWorld*, September 1988, 70-76.

Wilmot, R.W. "International Trends and Developments in EDI," *Proc. Conf. EDI '88*. London, England, November 1988, 15-21.

Vita

First Lieutenant Chad E. LeMaire was born on 04 September 1969 in Kaplan, Louisiana. He was commissioned a second lieutenant through the Air Force Reserve Officer Training Corps (AFROTC) upon graduation from University of Southwestern Louisiana (Ragin' Cajuns), where he received a bachelor of science degree in Psychology in December 1991. He entered extended active duty status in September 1992 when he attended the Basic Information Management Officer Course at Keesler AFB, Mississippi. Upon graduation from the course, he served his first tour as the Executive Officer for the 325th Bomb Squadron at Fairchild AFB, Washington. In October 1993, he was notified he had been selected to attend the masters degree program for Information Resource Management at the Air Force Institute of Technology. Upon completion, 1Lt LeMaire will be assigned as the Base Information Manager at RAF Mildenhall, United Kingdom.

Permanent Address:
142 S. Westview Ave.
Dayton OH 45403-2848

December 1995 Master's Thesis

THE WAREHOUSE INFORMATION SYSTEM (WINS): AN ARCHITECTURAL DESIGN FOR AN INFORMATION SYSTEM EMPLOYING THE WORLD WIDE WEB TO ENHANCE FOREIGN MILITARY SALES (FMS) EXCESS INVENTORY MANAGEMENT

Chad E. LeMaire, First Lieutenant, USAF

Air Force Institute of Technology,
2750 P Street,
WPAFB OH 45433-7765

AFIT/GIR/LAR/95D-5

Air Force Security Assistance Center (AFSAC)
1822 Van Patton Road
WPAFB OH 45433-5337

Approved for public release; distribution unlimited

The United States Government has long provided security assistance to foreign countries. Each year, billions of dollars of military hardware and equipment are sold through a process known as Foreign Military Sales (FMS). Unfortunately, most countries are now reporting that they are holding many items, sometimes billions of dollars worth, that are excess for their needs. At the same time, there are many countries in need of these items. Countries currently have two options for getting rid of the items—they can write them off or try to return them. Countries encounter problems with both of these choices. Naturally, if countries write off the items and destroy them, they lose the potential for selling the items. The two current return programs, Third Country Transfers and FMS Excess Materiel Return, have not provided a sufficient means for reducing and redistributing this excess. In response, the Air Force Security Assistance Center (AFSAC) has developed a program, the Worldwide Warehouse, specifically aimed at helping countries reduce their excess materiel. AFSAC wants to automate the features of the Worldwide Warehouse. This thesis provides an architectural design for an information system capable of automating the features of the Worldwide Warehouse..

Electronic data interchange (EDI), Electronic commerce (EC), Foreign Military Sales (FMS), World Wide Web (WWW), Internet, Logistics support, Worldwide Warehouse, systems analysis and design (SAD), NATO, NAMSA, Project SHARE 80

Unclassified Unclassified Unclassified UL