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A STUDY OF THE AIR FORCE'S
EXCEPTION MANAGEMENT PROCESS: ITS
EFFECT ON CUSTOMER SERVICE AND
ORDER PROCESSING

THESIS

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AFIT/GLM/LSM/91S-34

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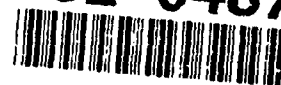
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THESIS

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David W. Jones, B.S.

Captain, USAF

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None of the accomplishments of the past 15 months at AFIT would have been possible without the constant companionship of the Lord Almighty. Through him, all things (including AFIT) are possible. I'm living proof.

David W. Jones

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Abstract

The purpose of this study was two-fold; the first goal
was to determine what the SBSS order processing is, and
secondly to determine the effect the current method of ECC
management has on the SBSS order processing cycle and the
level of customer service rendered by base supply.

The research revealed that exception management is a
crucial component of a successful order processing function.
Further, it was established that the level of customer
satisfaction experienced is greatly dependent upon good
order processing. Research further indicated flaws in the
current method of ECC management and recommended further
actions to correct the current method of ECC management.
The success of the SBSS order processing function is highly
dependent upon a sound system of managing ECC images;
however, the order processing functions do not need to be
directly involved in the management of the ECCs. Rather,
they require the ECC management function to merely keep
their mainframe up-to-date with valid ECC information.

This study is the first of its kind which links non-
customer serving functions of Base Supply to the
satisfaction level experienced by supply customers.

A STUDY OF THE AIR FORCE'S

EXCEPTION MANAGEMENT PROCESS: ITS

EFFECT ON CUSTOMER SERVICE AND

ORDER PROCESSING.

I. Introduction

Overview

Almost overnight our nation has changed. We have
transformed from a nation which produces to a nation that
performs. In this "take a number" society where over 80
percent of the American work force is engaged in service
activities, a real revolution is taking place
(Cannie,1990:9). More and more firms are joining the
customer bandwagon, and for good reason. Firms which make
it a practice to serve the customer are making money "hands
over fist". We can look at the "Japanese Miracle" story for
a testimony. They aren't successful because their culture
emphasizes productivity. Rather, their secret is a
commitment to customers for life (Cannie,1990:10).

There are American success stories as well. Nordstroms,
American Express, L. L. Bean, Caterpillar and McDonalds are
wonderful examples of success through a "service-driven"
strategy (Cannie,1990:13). One group of firms that is

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missing from the list, however, is the United States government. Traditionally, government organizations have been accused of not knowing what a customer is. According to Albrecht and Bradford, "it's a case of being unwilling or unable to view the customer as a source of valuable information for improving the quality of government service" (Albrecht and Bradford,1990:16). Unfortunately, the Air Force Base Supply system falls under this umbrella as well.

The goal of this overview is not to "shoot-down" American companies or governmental agencies. Rather, it is to set the tone for this research. Currently, customer service is a hot topic in all industries. It is appropriate that we look at our own systems to examine how our procedures might be affecting our ability to provide exceptional customer service. The system under scrutiny in this research is the United States Air Force Base Supply system, and particularly the Exception Management facet of the Order Processing function.

The Standard Base Supply System (SBSS) provides for its customers' needs through an integration of complex automated processes. Put simply, customers order products from a supply unit, and resupply of stock is accomplished through a depot. There is also a network through which shipment or transfer of assets to other supply units may occur. Figure 1 depicts this relationship graphically.

The system is acutely refined, and works well
(Turner,1991). It is also relatively standardized (as the
acronym implies) since all Air Force bases can use the same
supply system. There are, however, many exceptions to the
normal property flow. In fact, there are so many exceptions
that the Air Force has devised a very detailed set of
management guidelines to handle them. These guidelines
comprise a system known as Exception Control Codes (ECC)
Management (USAF,1987:Ch 19,38).
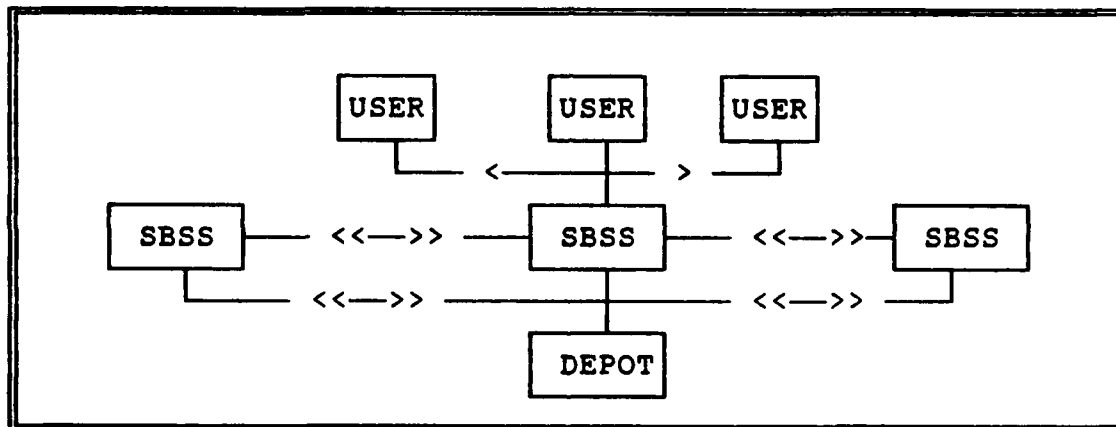
Figure 1: Simple Supply Network

The overall goal of Base Supply, or any logistics firm,
is to provide time and place utility -- i.e., the right item
at the right time for the customer (Stock and
Lambert,1982:10-11). This is affected through an order
processing system. Efficient exception processing is a
vital component of any successful order processing system
(Novich,1990:5). A 1988 study conducted by the United
States General Accounting Office (GAO) investigated several

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industrial companies with successful integrated inventory management systems to see what they did to become so good. In all companies, the GAO found a process which automated routine decisions and allowed managers to concentrate on exceptions (GAO,1988:17). Exception processing should be considered at least as important in the Air Force as it is in private industry.

General Issue

Many sections in base supply require the use of time-consuming, redundant, and inefficient computer listings to accomplish their everyday tasks (Turner,1991). A 1984 project by the Air Force Logistics Management Center (AFLMC) evaluated several of these activities to determine the feasibility of automating their management and operations on a microcomputer. One such candidate for automation was ECC Management (Kendal et al.,1987). As a result of this study, an automation project (ECC-I) was written and distributed to the field for implementation.

ECC-I was laden with problems. There are several areas in which ECC-I does not fill the needs of the supply technician (Eldridge,1991). As a follow-up to distributing the software for ECC-I, the AFLMC polled all using bases to determine what was wrong with the system. Responses showed that the product is difficult to learn and even harder to use. The major problems revolve around speed and reliability (Martinez,1988).

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Specific Problem

Because of these shortcomings, many bases have discontinued using the system and reverted to manual methods for simplicity (Drayden,1990 and Eldridge,1991). It is clear Base Supply cannot depend on ECC-I for its ECC management. Since exception processing is an integral part of the order processing cycle (as both Novich and the GAO pointed out) a solution or an improvement to the current methods of exception processing should be sought.

Research Objective

The purpose of this study is two-fold; the first goal is to determine what the SBSS order processing is, and secondly to determine the effect the current method of ECC management has on the SBSS order processing cycle and the level of customer service rendered by base supply. The plan was to identify where ECC management interfa.   .~h order processing and to determine any impact on customer service. This revealed potential areas where the current ECC management system (ECC-I) can be improved.

Research Questions

In order to accomplish the research objective, a series of research questions have been developed; when answered, they provided the direction necessary to solve the problem. The questions are stated below:

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1. What is the SBSS order processing system and how does it fit into the SBSS operations?

2. What is the current ECC management process?

3. What should an automated ECC management system entail?

4. What are the procedural shortcomings of ECC-I?

5. Can ECC-I be revised to better serve base supply and the customer?

Scope of the Study

This study was limited to exception processing in the United States Air Force Base Supply System. Research of the subject was accomplished at the Wright-Patterson Air Force Base (WPAFB) Base Supply organization. This particular organization was chosen due to its proximity to the Air Force Institute of Technology (AFIT). The results of this study can be applied to all standard Air Force supply operations but are subject to any Major Command or base supplements to the supply regulations.

Limitation

The results of this study will be applicable to ECC Management at the base-level supply. Depot-level or wholesale supply operations have a completely different method of ECC Management.

Assumptions

The following assumptions are made concerning this research effort:

1. ECC managers can provide specific information regarding problems with ECC-I.

2. Order processing managers can provide specific information regarding the order processing cycle.

3. Supply technicians can identify potential interfaces between exception processing and order processing.

Supply Organization (USAF,1987:Ch 2,45-99)

In the interest of non-supply personnel, this section is included to briefly describe the supply organization and the functions associated with the various activities. Any further clarifications regarding functional areas of Base Supply may be found in the supply manual AFM 67-1.

```
                        ┌─────────────┐
                        │  Chief of   │
                        │   Supply    │
                        └─────────────┘

┌──────────────┐    ┌──────────────┐    ┌────────────────────┐
│Management and│    │  Operations  │    │Materiel Management │
│Systems Branch│    │Support Branch│    │      Branch        │
└──────────────┘    └──────────────┘    └────────────────────┘

      ┌──────────────────┐        ┌────────────────────┐
      │Fuels Management  │        │Materiel Storage and│
      │     Branch       │        │Distribution Branch │
      └──────────────────┘        └────────────────────┘
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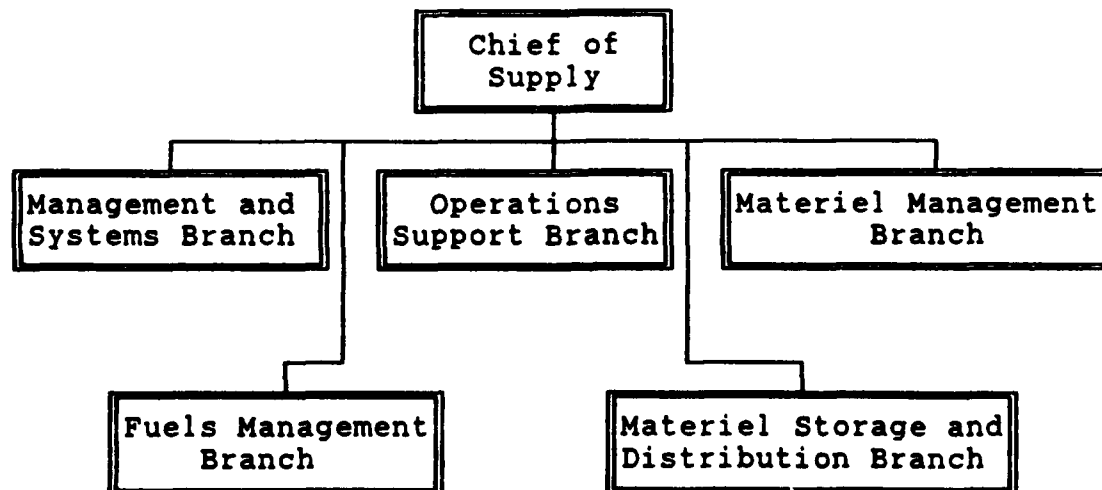
Figure 2: Base Supply Organization Chart

Each entity/branch shown in Figure 2 has specific responsibilities which are vital to the success of the supply account. These responsibilities are discussed below.

Chief of Supply. The Chief of Supply (COS) has overall responsibility for all of the supply related activities for a base. He/she is accountable for all supply assets and must ensure operations of the supply account IAW AFM 67-1. The COS directly supervises the officers in charge of each of the five branches. Specific responsibilities are numerous and can be found in AFM 67-1.

Management and Systems Branch. The Management and Systems Branch functions are very diverse. Included in this branch is the Customer Service and Training Section, Procedures and Analysis, Funds Management, Computer Operations, Inventory, Document Control, and Administration sections. The Training Section is often the first contact a customer has with Base Supply, therefore it is very important that the associated activities be properly executed in the interest of customer service.

Materiel Management Branch. The Materiel Management Branch has overall responsibility for Stock Control, Retail Sales, Equipment Management, Mobility, and Munitions Management. The Stock Control Section assures the correct stock is on hand and in the correct quantities. Additionally, nearly every organization on base has a need to use the Retail Sales Section for administrative or

janitorial supplies. It is easy to see how important a concerted orientation towards customer service is in this branch.

Operations Support Branch. The Operations Support Branch is the primary point of contact for customers desiring to order property. Included in this branch are the Demand Processing, Mission Support, Repair Cycle Support, War Readiness, and Operations Support sections. Ordering is accomplished by either the Demand Processing Section for routine items or by the Operations Support Section for aircraft items. The Mission Support Section handles requirements for assets which may be causing an airplane to be in a non-mission capable status (i.e., the plane can't fly because a part is broken). These conditions known as MICAP's are of vital interest to supply for obvious reasons. The Operations Support Branch is again a critical player in the customer support role of Base Supply.

Materiel Storage and Distribution Branch. This branch is responsible to the COS for processing, caring for, and protecting all supplies and equipment for which the COS has storage responsibility. This is accomplished by an organization which includes the Inspection, Receiving, Storage and Issue, Pickup and Delivery, and Bench Stock Support Sections. It will be shown later that this branch performs many of the functions crucial to the customer's order processing cycle.

<u>Fuels Management Branch</u>. This branch is responsible for the efficient operation of the base's fuels account. Included in this domain is requisitioning, receiving, storing, issuing, evaluating, and accounting for the fuels, cryogenics, missile propellants, demineralized water, and water alcohol used by the base. Since the flying mission of any base depends wholly upon the success of this branch's actions, it is easy to understand their essentiality.

Basic Definitions

The SBSS is laden with many terms which appear confusing. Below are a few of the terms used in this research.

1. Standard Base Supply System (SBSS): The computer system which handles all of the automation requirements of a base supply.

2. Requisition: Method by which an item is ordered from a depot (typically for re-supply of stock).

3. National Stock Number (NSN): Number which identifies each unique line item offered by a base supply.

4. Transaction: A computer entry which causes an action against a particular NSN. May be an order by a customer, a requisition from depot, a shipment to another base or report as excess.

5. Database - A file which can be accessed quickly and efficiently from all directions (Sherif,1988:22).

6. Database Management System (DBMS)

   - Centrally controlled repositories of master data, a means for exercising better control over information systems development (Sherif,1988:24).

   - "A database management system allows multiple independent users to have concurrent access to a central repository of information" (King,1981:12).

Summary

This chapter has suggested a problem common to many governmental agencies today, mediocre customer service. One way in which customer service deficiencies can be overcome is to study the functions which contribute to the dilemma and offer solutions. This idea is the foundation of this research.

Order processing is an important ingredient to any customer service strategy, and exception management is fundamental to order processing. Therefore, an examination of how exception management is accomplished with respect to order processing will ultimately impact customer service.

This thesis is organized into five chapters. Chapter I provided the background information about the specific problem. Chapter II presents a review of the pertinent literature regarding customer service, order processing, exception management and database management systems. In Chapter III the methodology used for this study is described. In Chapter IV the results of the study are presented and described. Chapter V provides a summary of the study and recommendations are put forth.

II. Review of the Literature

Overview

The purpose of this study is to determine the effects of the current exception management process on the order processing cycle and ultimately customer service.   In support of this objective, a review of the literature concerning customer service, order processing, ECC Management, and Database Management is presented in this chapter.

Customer Service

Introduction. Since the whole reason base supply is in operation is to provide a product for the customer, it makes sense that all operations should be geared toward meeting this goal. Order processing and exception management are not omitted from this line of reasoning. This section of the literature review will demonstrate how these two areas do indeed affect the level of customer service presented by an organization.

We begin our discussion with an overview of what customer service is, as it exists today. Next, a model which stratifies the various contributors to a successful customer service system is presented. The question of why customer service is important to the logistician is then investigated and is followed by a probe into two Air Force efforts to "get in touch" with the customer.

<u>What is Customer Service</u>? Customer service has been

around for decades, only it hasn't always been called that.

From the time Sears, Roebuck and Co. took the high road out

of their mail order headquarters in Chicago, retailers have

been giving the "anything you can do I can do better"

routine a real workout. Post World War II retailers began

to scramble for business, and they did it by trying to guess

what the customers wanted (Feinberg,1962:11). During these

times, however, customer service was something to be dealt

with by psychologists hired by companies. Rarely were there

any formalized methods assuring customer service; rather

customer service was sort of a "spin-off" of trying to

deliver the goods people wanted in the mad rush of the

retail revolution (Gottfried,1962:89).

Two of industry's leading researchers of customer service

are Bernard J. LaLonde and Paul H. Zinszer. In 1975 they

were commissioned by the National Council of Physical

Distribution Management to conduct an all-encompassing study

of customer service. Among their goals was to identify key

elements of customer service and to develop an appropriate

measurement tool (LaLonde and Zinszer,1976:ii).

Since customer service had become a "catch all" term to

identify all critical elements necessary for satisfying

customers, it was important for LaLonde and Zinszer to

define exactly what customer service was. The following are

definitions they found to be used most in industry.

1. Services over and above the assembly and sale of merchandise

2. The chain of events that is in the business of keeping customers

3. The sum of all interfaces between a company and its customers

4. Those activities that enhance or facilitate the sale and use of one's products or services (LaLonde and Zinszer,1976:270-271)

Evaluated, these definitions appear to follow three major themes: first, customer service is an activity; second, organizational functions which are directly involved in customer service are post-sales activities; and lastly, behind-the-scene activities aren't actually customer service -- rather it is the performance of these functions that constitutes customer service (LaLonde and Zinszer,1976:271). So it should be clear that customer service is affected by the whole organization, and that achieving good customer service is a synthesis of the actions of all concerned. It is not unfounded to consider each function of an organization a player in the achievement of customer service.

LaLonde and Zinszer were able to define several components of customer service. Figure 3 shows them in descriptive form. Together, the various components combine the assorted customer service aspects found in the

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```
        PRE-TRANSACTION ELEMENTS

   1.  Written Statement of Policy
   2.  Customer Receives Policy Statement
   3.  Organizational Structure
   4.  System Flexibility
   5.  Management Services


        TRANSACTION ELEMENTS

   1.  Stock-out Level
   2.  Order Information
   3.  Elements of Order Cycle
   4.  Expedite Shipments
   5.  Transship
   6.  System Accuracy
   7.  Order Convenience
   8.  Product Substitution


        POST-TRANSACTION ELEMENTS

   1.  Installation, Warranty,
       Alterations, Repairs, Parts
   2.  Product Tracing
   3.  Cust. Claims, Complaints, Returns
   4.  Temporary Replacement of Product
```

Customer Service

(LaLonde and Zinszer,1976:281)

Figure 3: The Customer Service Model

literature. It is expected that the critical elements of
customer service for a given firm will fall into one of
three elements represented: pre-transaction elements,
transaction elements, and post-transaction elements (LaLonde
and Zinszer,1976:272). We will now briefly describe the
three categories.

Pre-Transaction Elements of Customer Service. These
elements revolve around a corporate policy towards customer
service that is typically set by management. Pre-
transaction elements have been referred to as "soft
services" since they are not directly involved in carrying
out the physical distribution function. Although these
elements aren't part of the customer service application,
they are part of the organization's underlying approach to
service and they do influence product sales (LaLonde and
Zinszer,1976:272-273).

Transaction Elements of Customer Service. These are
the elements most commonly associated with customer service
since they are the actual "contact points" where customers
interact with the servicing agency.

Post-Transaction Elements of Customer Service.
These elements are generally supportive of the product in
use. The functions which support the use of the item can
upgrade it or even allow for repair, return, or exchange of
the product.

This discussion of LaLonde and Zinszer's Customer Service
Model allows us to visualize the entire realm of customer
service. It provides the needed framework by which the
elements of customer service may be organized. Since this
is a general model and is neither industry nor firm
specific, the Customer Service Model is easily applied to
the SBSS.

We now turn our attention to examining the idea of the
logistics arena's importance in customer service. Through
this discussion, it is demonstrated that the functions
provided for by the logistics system comprise this notion of
customer service.

Customer Service and Logistics. Logistics can be
defined in many ways. Two noted authorities in the
logistics field (Stock and Lambert) defined logistics in
this way.

> ...the integration of two or more activities for the
> purpose of planning, implementing and controlling the
> efficient flow of raw materials, in-process inventory and
> finished goods from point-of-origin to point-of-
> consumption (Stock and Lambert,1982:9)

and these activities may include

1. demand forecasting

2. inventory control

3. material handling

4. order processing

5. warehousing and storage

6. distribution communications (Stock and

    Lambert,1982:9)

According to Novich (of Bain and Company, a management
consultant firm), regardless of what customers buy, they
also buy a measure of service along with it. In fact, more
and more frequently customers' purchases are based on the
combination of product features, product quality and service
that reduces their total systems costs. Novich contends

that poor service can more than double the purchase price of products for a customer. The basis for this claim lies in the fact that firms must stock more inventory if they perceive late deliveries are likely. Also, customers must institute elaborate system of shipment and invoice monitoring if even relatively few errors in shipment exist (Novich,1990:1-2).

With this in mind, it is not surprising to see that a recent study by the University of South Florida revealed that meeting promised delivery dates, accuracy in filling orders, advance notice of shipping delays, action on service complaints, and length of promised lead times for in-stock items were the most important variables when choosing a supplier (Novich,1990:2). It should be obvious that many of Stock and Lambert's elements of logistics were reveled in this study. Logistics-related variables were the most important to the customer. Considering this, Novich's words are quite accurate; good service can be defined as good logistics (Novich,1990:2).

Where Problems Occur. Of course most companies recognize that customers think service is important. However, many companies fall short in various ways.

1. Few companies use a measure of service relevant to their customers

2. Even internal customer service measures are frequently inaccurate

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3. Service measures are frequently not actionable (i.e., too little to late)

4. Little direct feedback is obtained from customers

5. The great majority of companies do not have reliable intelligence on the service level being provided by competitors (Novich,1990:4)

These and other service problems typically stem from a complicated internal logistics process (including order processing and processing exceptions to standard practices). To remedy these situations, Bain and Company recommend

1. Identify the leveraged exceptions

   -occurrence rate

   -complexity

   -impact on customer satisfaction

2. Reduce the exception rate

3. Streamline the process, with and without exceptions

4. Automate the streamlined process, as appropriate (Novich,1990:5)

In summary, customer service is provided by the logistics function. Further, companies can better serve their customers by getting to know their customer's needs, streamlining the processes by which the customers get their goods (order processing) and by reducing exceptions to the normal routine. The next section of the literature review examines two separate research efforts geared towards putting Base Supply in touch with the customer. One effort,

"Nordstroms in Blue", is a base-level attempt to identify the needs of the Base Supply customer and to pose possible solutions. The other, a thesis project completed at AFIT, surveys Base Supply customers of a whole command and reports on the findings. Each project reveals some interesting insights about the Base Supply customer.

Base Supply and Customer Service. Base Supply's customers may question whether or not Supply really is concerned about customer service. There have been efforts, though few, which have attempted to put Base Supply in touch with customers. An example is a 1988 study by a Williams Air Force Base Customer Service Team.

In "Nordstroms in Blue", the Customer Service Team attempted to get in touch with the customers by identifying what Base Supply does well and what they do poorly. The team members stationed themselves at key customer service points to observe supply-customer interaction. They later followed up with the customer to discuss their experience. The team found that any frustration experienced by the customer was perceived to be because of the apparent huge amount of red-tape encountered and not due to personnel. In other words, customers blamed the system for their frustration, and not the people. Based on this finding, Williams Base Supply developed a program to streamline the amount of "run-around" which may be caused by their numerous forms or letters required of the customer. Several

redundant/useless forms and letters were eliminated, many of which were the target of customer's frustrations. Overall, the project was a huge success because it was a positive step towards getting supply personnel involved in making things more plausible for the customer (Schroder,1991).

Another more "macro" approach to the same general issue is a 1990 Master's Thesis accomplished by Capt. Esperanza Flores at AFIT. She queried Base Supply customers of the Tactical Airlift Command to see just what they thought of Base Supply's customer service. Flores found that Base Supply customers are very aware of how well they are served by Base Supply. Additionally, supply customers know what aspects are important for Base Supply to provide if customers are to be content with the service rendered. The most important functions, as seen by the customer, include the order cycle, demeanor of supply personnel, general service, responsiveness, item availability, and order processing. Flores found these areas were also key components in LaLonde and Zinszer's customer service model -- be it verbatim or in concept (Flores,1990:90). Therefore, it is reasonable to assume that customer service literature and research conducted on private firms is also applicable to Base Supply.

Flores also showed that in the customer's eyes, Base Supply performs only satisfactorily in the above areas (Flores,1990:95). It is clear that order processing is

indeed important to the customer, and worth improving in the interest of customer service. It would follow, then, that any associated function of order processing would likewise be important.

Précis. We have established that logistics is a main component of a successful customer service program. Our literature search will now tunnel a little deeper to determine how Base Supply accomplishes the Customer Service Model presented by LaLonde and Zinszer specifically through an examination of the SBSS order processing system. More particularly we look at how Exception Management interrelates with the various order processing functions within the SBSS.

In charting the above heading, it is first necessary to establish what an order processing system actually is. The following portion of the literature review accomplishes this, and sets us up for an investigation of the SBSS order processing system.

Order Processing

Introduction. "The order processing system is the nerve center of the logistics system. A customer order serves as the communications message that sets the logistics process in motion" (Stock and Lambert,1987:499). This section of the literature review will examine order processing as it exists in "typical" corporate America. A later section will

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apply this knowledge to our own SBSS order processing system to demonstrate how closely it emulates industrial practices.

Customer Order Cycle. Order processing is best studied by defining what the customer order cycle is. Figure 4 depicts this cycle graphically. In words, the customer order cycle includes all of the time and processes from the placement of the order until the product is received and placed into the customer's inventory. It should be noted that there are many components of the cycle and each must be considered important. Often, managers mistakenly consider only the portions of the cycle which are internal to their control (e.g., order receipt, processing and picking/packing). This block of activities account for only a portion of the whole customer order cycle, and concentration on these activities alone may over-look opportunities for improvement in the other areas (Stock and Lambert,1987:500).

```
+---------------+       +------------------+       +---------------+
|   Customer    |       |     Order        |       |     Order     |
| places order  |- <<-  |delivered to cust |- <<-  |   Shipped     |
+---------------+       +------------------+       +---------------+
        |                        |                         |
+---------------+       +------------------+       +---------------+
|     Order     |       |     Order        |       | Order picked  |
|   received    |->> -  |   processed      |->> -  |  and packed   |
+---------------+       +------------------+       +---------------+
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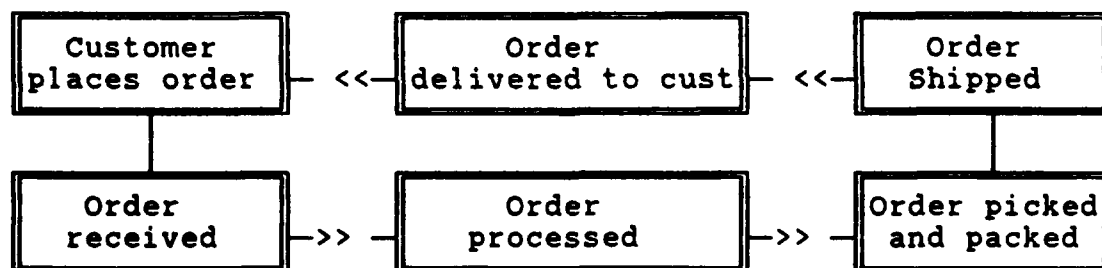
(Stock and Lambert,1987:500)

Figure 4: Customer Order Cycle

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<u>Methods of Order Entry</u>. Since the whole order
process is "sparked" by a customer placing an order, it
makes sense that we look for a moment at the various methods
by which a customer's request may be entered into the order
cycle.

Historically, customers wrote down their order and gave
it to a salesperson or mailed it to the supplier. This
practice is still practical, dependent of course upon the
industry. For example, an industrial firm with an avid
sales staff would be more likely to utilize this method than
would a food industry.

The next level of sophistication is telephoning orders to
customer service representatives located in an order
processing section within a firm's headquarters. This
method streamlines the order process somewhat since it
facilitates "real-time" filling of orders. If stock is not
available, computer-equipped technicians are able to advise
customers of expected delivery and possibly arrange
substitution of product in the event of stock-out. This
method effectively reduces the customer's total cycle time,
thereby partly justifying its obvious expense over the
"traditional" mail-in system (Stock and Lambert,1987:503).

This later type of order entry system falls into the
broad category of Advanced Order Processing Systems. They
are referred to as "advanced" since they put information
into the hands of the customer which had never before been

available. The catalyst for this upheaval lies in the power of the computer. "No component of the logistics function has benefited more from the application of electronic and computer technology than order entry and processing" (Stock and Lambert,1987:506). Computer programs have been written which routinely provide a vast array of product and customer information to the order clerk. As a result, customers are more informed and deviations from standard procedures can be handled smoothly (Stock and Lambert,1987:507).

   Typical Order Process. Referring back to Figure 4, it is apparent that the order process is potentially affected by many different sections/divisions within an organization. It follows from the figure that a typical order process would include an order/demand processing function whose responsibilities would include entering the customer's demand into the firm's computer system. As mentioned, the method by which the firm receives the customer's demand is dependent upon the system in place (i.e., by mail, phone, fax, etc.). Once the demand is input into the system, the property would either be picked from available stock or back-ordered through the firm's supplier in the event of stock-out. This "picking" function would fall within a warehouse environment. Next, the item would be prepared for shipment/delivery to the customer with subsequent shipment/delivery following. Lastly, the

customer would receive the item and place it in his/her stock.

It is obvious that this is a generic model of a customer's order process. As we will see in the next section, implementation of this model may appear slightly more complicated dependent of course on the organization.

SBSS Order Processing

Introduction. As established earlier, exception management is an integral part of order processing. To understand the full need of the SBSS exception management process, one must also understand the order processing environment in which it operates. This section of the literature review is dedicated to order processing in the SBSS. We show how the SBSS is similar to Stock and Lambert's model of order processing while at the same time demonstrate how diversified the order process may become.

Methods of Order Entry. Just as Stock and Lambert's model suggests, the whole order process within the SBSS environment starts with a customer's request. At the base level supply unit, there are several methods by which a customer's order may be communicated to supply. The differences lie mainly in the type of demand the customer is making. It is appropriate at this time to discuss the various types of demands which may be levied upon a supply account. The full explanation of each category of requests will not be given since that would require extensive

explanation of supply users' activities. Rather, we will briefly mention the various demands with some easy explanation given.

Routine Requests (Crowther,1991). Routine requests (which encompass a vast majority of the requests) for supply assets are handled through the Demand Processing Section, Operations Support Branch. This section serves as the primary point of contact for the customer. They are equipped to assist the customer in researching possible requests and they ultimately initiate the order process for the customer. There are several methods at WPAFB Base Supply for the customer to communicate a request--the choice of which depends on the customer's needs.

The first method we will discuss is the "traditional" method in which the customer drops their request by the "salesman", or in supply's case, the demand processing clerk. If the customer is familiar with the SBSS, then their request is usually properly filled out and the order process is begun by the clerk.

The second method commonly used at WPAFB Base Supply is a call-in. This procedure involves a customer calling in to the Demand Processing Section with a request. The demand processing clerk takes the individual's request and the order process is begun. Along with call-in capability, WPAFB Base Supply utilizes a tele-facsimile (fax) machine for the customer's convenience. Customers have sample

copies of the necessary request forms at their office. They simply fill out the form and fax it into the Demand Processing Section. This begins the order process as well.

There is another method of order entry for which WPAFB Base Supply is the test base for the Air Force. It is an automated call-in procedure which utilizes touch-tone phones to call-in a request. The customer simply dials a phone number, and follows the digitally-recorded instructions. The customer must know the correct NSN which he/she is ordering, and the NSN must be valid for the request to be processed. This system is what Stock and Lambert would call an Advanced Order Processing System. Not only can the customer order property this way, but they can also request information about other possible requisitions which may be pending (known as a status inquiry). The system interfaces with our Sperry 1100/60 mainframe computer and queries at the customer's request. As mentioned, this system is in testing, and if successful will be implemented Air Force wide.

Special Order Processes. As shown, there are several ways in which Base Supply empowers the customer to place a demand on supply. However, the Demand Processing Section isn't the only function which can initiate an order. There are several other "special" ways in which a customer's demand may be initiated or filled.

Base Supply has determined there to be some special groups of commodities which are requested often and customers would rather shop for in a "hands-on" fashion. These assets are mainly office and janitorial supplies and are conveniently located together in the Retail Sales Section of the Materiel Management Branch. In addition to these items, individual issue items and tools are also incorporated into "the store" for the customer's convenience.

This concept is a radical disjunct from the standard order entry method described earlier. Instead of placing an order through the Demand Processing Section and letting the process go from there, the customer now has their property in hand from the start and desires to purchase it much in the same fashion as a shopper at Wal-Mart. The process isn't quite as simple as Wal-Mart, but the concept is the same. The shopper must be authorized to spend an organizations Operations and Maintenance (O&M) money, and in the case of individual equipment issue, the shopper must be authorized the actual item (no flightsuits for the office clerk).

Another "special" method of order entry which is becoming more and more common is entry via remote input terminal. What this means is that customers on the base have a supply-furnished terminal for which to input their own demands. They must undergo several training classes taught by the

Training Section of the Management and Systems Branch, but effectively they arc their own demand processors--no more going to supply for order entry. The SBSS processes the request the same as any other order entered into the system, as we will see in the next section (Taylor,1991).

The Demand Processing Section is typically located in the main supply building. This location is best since it puts demand processing close to all of the other key functions of supply. Since the vast majority of the customer's orders are received via telephonic means, this location works well for customers too. However, for the maintenance crews working on the flightline, having to deal with a demand processing clerk who may be miles from their location, the estrangement may not be as convenient. Since maintenance is by far supply's biggest customer, the supply community has developed the concept of forward support warehouses. The idea is simple. Supply places fast-moving, high-demand parts along with demand processing capabilities out in a flightline location, close to the customer. The customer may now simply walk "next door" to place his demand and receive his part--all in one motion. This saves time and creates less hassle on the part of the maintenance technician. It is important to note that each of the Major Commands have their own implementation of this concept, and they may vary dramatically. This, then, is still another "special" method by which the customer's order process may get started (and in this case finished) (Miller,1991).

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Processing of Order. Referring back to Figure 4, the customer has now placed their order and supply has received it. The next logical step is for the order to be processed. This goes beyond just inputting the request into the SBSS (of course this is the first step). Once the request is input, the SBSS goes through the steps shown in Figure 5.

As the figure shows, if supply has the requested part on hand and in the correct quantities, the request is filled. The SBSS determines which warehouse the item is stored at, and then sends the request to the storage personnel within
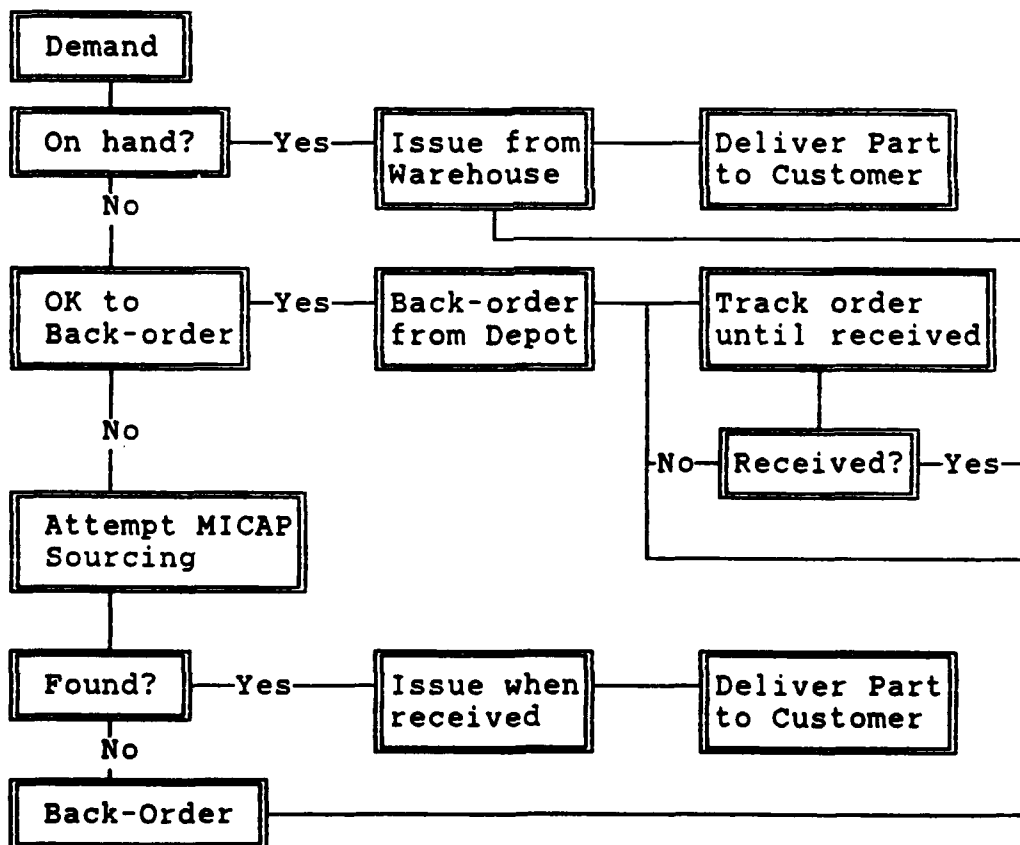

Figure 5: SBSS Demand Flow

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the proper warehouse. This is done electronically of course (the request outputs on the correct terminal). Storage personnel first "pick" the item from warehouse stock. They then forward it to the delivery personnel, who subsequently deliver it to the customer. Recall that if the request is originated at a forward warehouse location, all of these operations may be accomplished by the same person since all of these functions are co-located. In most cases, however, the "picking" is done by the Storage Section and subsequent delivery is done by the Pickup and Delivery Section--each of the Materiel Storage and Distribution Branch. This covers the scenario for when an item is in stock. The path of the order process is somewhat different if the item is not in stock.

If the SBSS cannot fill the request (i.e., the item is out of stock or is not stocked at all), then a backorder condition exists. One or twc things can happen at this point. The first and easiest of which is a backorder which gets created by the SBSS for the customer. A backorder is like supply issuing an "IOU" to the customer for the requested property. The SBSS automatically orders replenishment stock to fill the "holes" in the warehouse when stock has been depleted below established levels. When the order comes in from the depot for replenishment (recall Figure 1), the backorder to the customer is filled and the property is delivered (Crowther,1991).

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Let's look at the other thing that can happen when a backorder condition exists. In many cases, the demand of interest is for a system part (airplane, missiles, etc.) which may not be capable of performing its mission without the part. An example would be: if supply was out of brakes for an F-16, then the plane, in all likelihood, would not be able to perform its mission (i.e., it would be "non-mission-capable"). Supply calls this a MICAP (from Chapter I) condition. If a MICAP condition results in the event of a backorder, supply takes special actions to locate the correct part. An "IOU" is first established for the part, then the MICAP Section of the Operations Support Branch attempts to "source" the part through the Micap Automated Sourcing System (MASS). MASS basically queries the computer system of all world-wide users to check if they have an available part. If so, then the part is "laterally" shipped to the supply unit in need. Once the part is received, issue is the same as for the first backorder case and the backorder ("IOU") is cleared. If the part is not available anywhere, then the backorder for the part is left in the SBSS and the MICAP condition is continued until the part is received. This is a simplistic view of MICAP and MASS sourcing. Additional information is found in AFM 67-1. (Morinec,1991)

Now that we have a grasp on the SBSS order processing system, let's now look at how the exception management

process works. We first study the concepts of ECC
Management, followed by an examination of how the automated
ECC-I operates.

ECC Management

The SBSS is a large collection of automated processes
which provide for all of the necessary computer processing
of the base supply unit. Some of the functions in this
arena are for customer ordering, stock replenishment, stock
shipment, and excess stock reporting. If the SBSS
environment were fail-safe, the processing could occur
without interruption; unfortunately, it is not. There are
exceptions to every process.

Exceptions occur when a transaction (issue, requisition,
shipment, or excess reporting) involving a particular NSN is
processed through the SBSS (either by supply personnel or
automatically). The exception is a "flag" indicating
special attention is required to process the transaction
against the NSN. It may also serve as an internal "flag" to
indicate a particular condition exists with the NSN. In
either case, special attention is required before processing
can proceed (USAF,1987:Ch 19,38).

Exceptions are caused by codes which are deliberately
assigned to a particular NSN. For every NSN record
maintained in the SBSS database, there is a field for each
of the four types of exceptions. If nothing is contained in
the fields, then transaction processing is not interrupted.

However, if there has been something assigned to the field(s), special action will be required by supply personnel.

The particular attention required is dictated by the value of the exception code causing the interruption. For example, if an interruption occurred when an issue to a customer is processed, the value in the issue exception field represents what action is required (Drayden,1990).

As stated, there are four types of exception codes/fields: issue, excess, requisitioning, and shipment. There are also different classifications of each. Therefore, there are several different values of each type of exception and only one of each type may be assigned to an individual NSN. A particular NSN may potentially have one of each exception type assigned to it. The explanations/directions associated with the specific exception code assigned to an NSN is not maintained in the SBSS. This creates a real problem in managing the exception process. The information required to make decisions when an interruption occurs, is not readily available in the mainframe computer (Drayden,1990).

Historically, the SBSS employed a system of manual records to manage the information required for exception processing. The system involved creating a document for each NSN which had an exception control code assigned (USAF, 1987:Ch 19, 38). Punched cards were output from the

mainframe to inform technicians of automatic code assignments and technicians had to input punched cards informing the mainframe of any assignments made locally. The whole process was manual and extremely time consuming (Drayden,1990).

ECC-I

Background. A previous AFLMC project on Enhanced Listings Management (Kendall,1987) automated ECC Management. The programs provided an automated method for monitoring each NSN with exception codes assigned. The particular software package used to create the application programs was dBASE-II^{tm}, and they were designed to run on most of the microcomputers in the Air Force. The project was successful in its most important goal, elimination of punched-cards; however, the procedures which comprise ECC-I fell far short of most expectations.

ECC-I Shortfalls. The major problem encountered in using the system is its speed. An inefficient method of organizing the various data records causes even the most basic operations to be unacceptably slow (Eldridge,1991). The database search routines are equally inefficient and difficult to use. Additionally, there is a flaw within the logical flow of the system which allows the user to input duplicate records. Duplicate records are a problem because actions regarding an ECC record may be recorded on one of the duplicate records, and a subsequent "look-up" of

information may access the other record -- thereby not showing the correct information (Drayden,1990). Perhaps the most important function of ECC-I is a reconciliation with the supply mainframe computer. Since the success of the system depends upon the mainframe having the most current information regarding the ECC's, a reconciliation between the two systems is vital. As mentioned earlier, the reconciliation is the process by which the stand-alone system and the mainframe system keep in synch. The process is simple. First a program is run on the mainframe to output to diskette all ECC images it has on file. This output is received by the ECC manager and fed into ECC-I. ECC-I "reads" the data disk file and compares its data with the data internal to ECC-I. Any disparities are corrected programmatically with a "change" file created. This "change" file represents any records which did not match between the two systems (Eldridge,1991). This reconciliation is also the biggest source of problems. Much information concerning ECC cards is lost through the reconciliation, thereby rendering the system unreliable (Martinez,1988).

Database Management Systems

Microcomputer-based database management systems can have a far-reaching impact on the Air Force work environment. Adequate system design and development requires an in-depth knowledge of how such systems work. The following review of

current literature on Database Management Systems and system design is presented since the current ECC system is applied via a database management system.

A complete understanding of a DBMS is necessary to effectively evaluate a problem area where a potential application of a DBMS exists. If a DBMS application is feasible, it is equally important to understand how to construct such a system.

Database System History. Ironically, the term "database" originated at a computer conference organized by the U.S. Military in 1963 (Sherif,1988:21). It wasn't until the late sixties that the relationship model of data organization was introduced. This idea served to formulate the building blocks of subsequent database systems. The father of this idea was Dr. Ted Codd, an IBM research worker (Stonebraker,1988:1; Rolland,1989:9).

Movement Towards Micro-Computers. "Although the information systems industry has been fast-paced and continuously changing since its conception in the mid 1950's, nothing prepared the industry for the tornado-like impact of the microcomputer" (Kroenke and Nilson, 1986:viii). The questions of how and where database technology would be integrated into the PC environment became increasingly complex.

Differences between mainframe computers (traditional database application arena) and PC's usually center around

mere size and capability of handling large or even huge amounts of information. PC's are thought of as being capable of handling several million characters, whereas a mainframe database typically handles several billion. Another major difference is that mainframe systems are typically shared by several users versus a PC system which is oriented towards one or just a few users (Kroenke and Nilson,1986:ix).

PC's put the power of a computer into the hands of users who had never before been able to afford such a luxury. Costs of the mainframes used in large database systems were simply overwhelming. With the advent of affordable PC's, the idea of managing large quantities of similar data became more appealing to the average consumer. Commercially available DBMS software systems quickly emerged to facilitate this passion (Poor,1987:109).

Why DBMS's are Needed. DBMS's offer several advantages to the system user. The first and most important advantage is the versatility allowed by the DBMS. More information is obtainable from a given amount of data. If data is partitioned, as is the case in standard files, there is not a chance for cross-flow of information. However, if a DBMS is employed, information regarding combinations of each file is readily accessible. A second benefit of DBMS's is the elimination or reduction of data duplication. Information is required in only one file of the system and is available

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throughout the application. Hence, a reduction in storage
media is possible since data need only be saved in one file
(Kroenke and Nilson,1986:4-9). It is easy to see that
DBMS's play a vital role in the information system of nearly
every organization, large or small.

Software Design and Development (Simpson,1987:35-47).
The popularity of PC-based DBMS Software has opened many
doors for creative applications. The process should follow
some structure which requires much planning. One model of
software development suggests the following phases, which
will be discussed individually.

1. Problem definition

2. Database design

3. Modular program design

4. Coding

5. Testing and enhancing

Problem Definition. The first step in defining a
problem is to develop the specific goal for which an
application is being sought. The specifics of what data is
available and what the process is going to produce are
referred to as input and output. An important step in this
phase is preparation for exceptions--situations which will
not go through the normal flow of the program. They must be
addressed early in the process to avoid complicated work-
arounds later.

Database Design. Deciding what information needs to be stored is very important. If done incorrectly, the advantages of the DBMS mentioned earlier could be negated. Database planning is the process of determining the relationships between separate data files. Also included in design is the aspect of database sizing. Future company expansion, added employees, and larger product lines are but a few things which could affect the database size.

Modular Program Design. The overall system should be closely scrutinized to group major functions together (i.e., payroll, accounts payable, accounts receivable). These individual modules may be further broken down into smaller tasks to facilitate ease of updating and coding.

Coding Techniques. If the preceding phases have been followed closely, actual program-coding can now occur. It is in this phase that edit and validation checks should be conceptualized. Users will not input 100 percent correct data, so extensive error-checking routines may be warranted. The adage "garbage-in-garbage-out" must be foremost in the programmer's mind.

Testing and Enhancing. Software systems are rarely ever complete. With this in mind, reducing the time needed to maintain the system should be considered. Thorough testing and evaluating can help catch many problems before the system is actually put in use. Positive and negative testing should occur. Positive testing simply demonstrates

the program can do what it is intended to do. Negative testing involves deliberate attempts to circumvent the system with the goal being smooth error-handling capability. Enhancements to the system should be done through new modules if possible, to isolate possible problems caused by the changes.

Summary

A comprehensive look at customer service, order processing, exception processing, and database management systems has been presented in this chapter. It should be clear that order processing is an important player in a successful customer service scheme. Likewise, it has been shown that exception management is a key player in order processing. Research showed that the current method of exception management (ECC-I) fell short of original expectations, and that an improvement should be sought.

III. <u>Methodology</u>

<u>Overview</u>

The literature review provided the background for the methodology used in this study. This background was important since exception management plays such a crucial role in the Base Supply order processing arena. The drive behind this methodology was to identify where exception management fit into the overall order processing scheme, and to determine guidelines for an improved automated system of exception control.

This chapter presents an explanation of the research methodology designed to identify those interrelationships between exception management, order processing, and ultimately exception management's impact on customer service. Also presented are the steps followed to collect the necessary information to answer the investigative questions posed in chapter I. The information sources are identified and the methods used for requirement analysis are described.

<u>Objectives</u>

The specific objectives of the methodology designed for this study were as follows. First to identify the exception management system as it exists in practice. Second, to identify the main components of the order processing system. Third, to identify the effect exception management has on

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order processing components and to determine the problem areas. Fourth, to identify any opportunities available to Base Supply to improve customer support through a better exception management system. Lastly, to provide a set of parameters for which a better exception management system could be developed.

Research Design

The research design for this study was developed based on guidelines presented by Walizer and Wienir. In their book, Research Methods and Analysis, Walizer and Wienir make comparisons between formal surveys (a much used approach in gathering information) and interviews. Based on the pros and cons of each, this researcher chose to use interviews as the approach to gathering information. There are several reasons why this method was more suited to this research effort.

The first reason interviews were favored revolves around the fact that surveys require questions to be direct. Whereas with interviews, general knowledge may first be sought, with further discussion about items of specific interest addressed as deemed appropriate (Walizer and Wienir,1978:289). Since it was hard to tell just what information would be gathered at the onset, interviews were the only likely candidate for information gathering.

Typical arguments against interviewing often include cost (Walizer and Wienir,1978:290). This debate was not

applicable to this research effort. Since the subjects of interest were located on the same military establishment as AFIT, cost of interviewing was not a factor.

The researcher was able to categorize the research into two distinct phases: problem definition and system mapping. Each is described in detail below.

Problem Definition. During this phase, a complete review of the available literature was conducted. This involved researching Air Force Manuals, government agency reports, articles and books on order processing and customer service, along with history-based interviews. This was done to gather all available information about the ECC Management system as it exists today and to correctly determine its relationship with order processing and its effect on customer service.

System Mapping. This phase involved collecting data from interviews to completely define how the system should mesh. Interview questions were developed using the guidelines set out by Sudman and Bradburn in their book Asking Questions: A Practical Guide to Questionnaire Design. Interviews were conducted with supply technicians from WPAFB Base Supply. These interviews, combined with the analysis of data collected during the Problem Definition Phase, provided the information needed to answer the research questions.

Selection of Subjects

Subjects were selected based on their expertise in the order processing environment. Subjects from all of the order processing functions were included. All were considered by their co-workers and managers to be the experts in their area. The sections of Base Supply which are involved in order processing were identified by researching AFM 67-1, Chapter II. This chapter outlines the responsibilities of each section within Base Supply. The pertinent sections were determined to be the Demand Processing Section, Retail Sales Section, War Readiness Section, Repair Cycle Support Unit, and the Mission Support Section. Subjects were also asked who they recommended for potential candidates for interview.

The bounds of the research effort had to be extended somewhat to include an individual from Williams AFB and Headquarters Air Training Command (ATC). The reason is because WPAFB Base Supply had never actually used ECC-I, whereas Williams AFB had used it. The individual from HQ ATC was interviewed because of his decades of experience in the SBSS operating environment.

Summary

Chapter III defined how the research method was conceived and established the legitimacy of the interviewing approach to information collection. Additionally, the rationale for subject choice was discussed. It was important to chose

experts in the various order processing arena for interview.
The individuals had to understand their domain completely
and also possess a broad understanding of the whole SBSS
concept of operations. This discussion sets the stage for
Chapter IV where we will discuss the results of this
combination interview and literature search methodology.

IV. Results

Overview

This chapter provides a summary of the research conducted
on exception management and the SBSS order processing cycle.
The methodology presented in Chapter III was executed, and
answers to the research questions proposed in Chapter I were
developed. The following accounts describe what conclusions
were made, and from what research they are based. Each
research question is addressed individually, with the
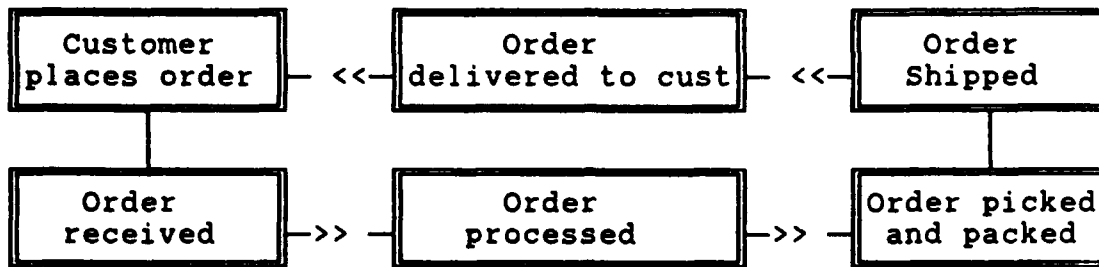various steps taken to arrive at the conclusions noted.

Question 1

"What is the SBSS order processing system and how does it
fit into the SBSS operations?"

This question was answered during the literature review
phase of this research. It was determined that a complete
understanding of the SBSS order processing system would not
be possible without a thorough understanding of a "generic"
order processing system. Fortunately, a body of literature
existed which provided this exact background. Stock and
Lambert are two of the most noted authorities in the
Logistics arena, and they have completed extensive research
regarding Order Processing and its importance to the
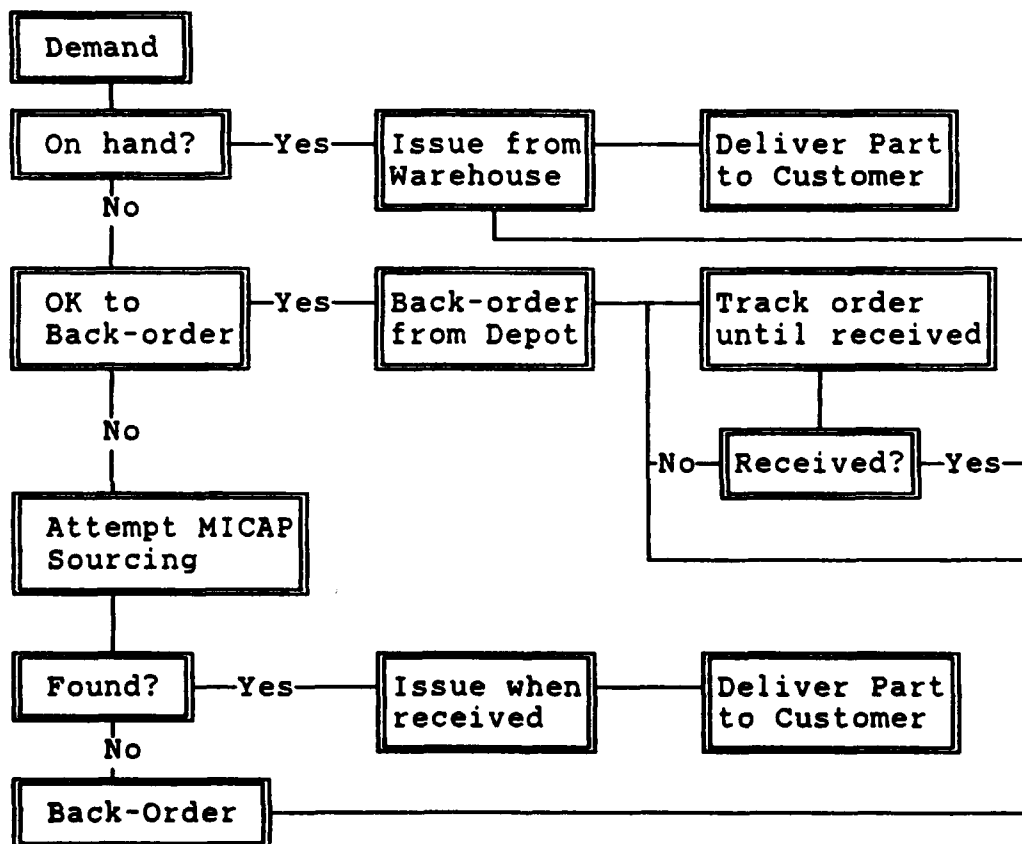marketing function of a firm.

This background provided a well-suited model by which to
examine the SBSS. It was found that the SBSS followed

closely the order processing model as presented by Stock and

Lambert. Figure 6 is a graphical comparison of the Stock

Customer places order		Order delivered to cust		Order Shipped
Order received		Order processed		Order picked and packed

(Stock and Lambert,1987:500)

(Generic Order Processing Model)

```
Demand
  |
On hand? ──Yes── Issue from ──────── Deliver Part
  |               Warehouse           to Customer
  No
  |
OK to ──Yes── Back-order ── Track order
Back-order    from Depot    until received
  |                              |
  No                    ─No─ Received? ─Yes─
  |
Attempt MICAP
Sourcing
  |
Found? ──Yes── Issue when ──────── Deliver Part
  |            received            to Customer
  No
  |
Back-Order
```

(SBSS Order Processing Model)

Figure 6: Generic and SBSS Order Processing Model

and Lambert "generic" model of order processing and the SBSS model as derived by this researcher. It is easy to see how the various functions are similar. The nuances, as expected, lie in how the model is executed (i.e., what functions within Base Supply perform the tasks). It was found that for each of the elements of Stock and Lambert's model, a similar function was being accomplished at the Base Supply function. These findings were completely divulged in Chapter II.

To further evaluate research question one, it was necessary to ascertain what role order processing plays in the SBSS operations. From Stock and Lambert's model of order processing, the researcher suspected that order processing was the "king-pin" of the SBSS operations. This proved to be true. As can be extracted from the literature review, it was shown that the whole Base Supply logistics process begins with an order being placed into the SBSS. Therefore, the role of order processing in the SBSS was determined to be that of an "initiator" of the system, without which, nothing could happen.

Question 2.
"What is the current ECC management process?"

The literature review provided the necessary background to analyze this question as well. For the most part, the current ECC management process is an ad-hoc computerized database management system. The stock contro technician

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inputs the ECC images into the system and manually reconciles the database against the ECC images loaded in the Sperry 1100/60 mainframe computer. The system is just barely better than the manual methods employed prior to the AFLMC project which automated ECC management. Many Base Supply ECC managers have completely abandoned this project, WPAFB included. The reasons are vast, and can be referenced in Chapter II.

Question 3

"What should an automated ECC management system entail?"

This question was answered in part through the literature search. However, the most valuable information toward answering this question came from personal interviews of personnel currently in charge of ECC management along with those performing various order processing functions.

From the standpoint of the order processing functions, which included the Demand Processing Section, Mission Support Section, Retail Sales, War Readiness Section and the Repair Cycle Support Section, no special requirements were levied on a desired ECC management system. There was no disagreement that exception management was pertinent to their successful order processing operations. However, the only requirement of these units was that the Sperry 1100/60 mainframe computer be kept up to date.

The order processing functions displayed little knowledge of how the mainframe was kept up to date. The updating process, as shown in Chapter II, is one the primary justification for an accurate ECC Management system. Therefore, it can be said that the order processing functions are dependent upon the ECC Management system, but they are not normally aware of what must happen for the system to be exact.

To conclude discussion about what the ECC Management system should entail, it follows that the order processing functions would not have any special requirements of the ECC Management system. Therefore, the determination of what the system should be would lie wholly within the Stock Control Section with the ECC Monitor/Technician. This desired system should closely resemble ECC-I, only with the required enhancements as disclosed in Chapter II.

Question 4

"What are the procedural shortcomings of ECC-I?"

This research question was completely answered by the literature review in Chapter II. The majority of the shortcoming of ECC-I are "programmatic" in nature. The programs were written at a time in computer-history when little attention was paid to user-friendliness. Additionally, it must be noted that when ECC-I was being sent to the field, there was little real expertise in the PC programming environment. Most of the programmers were not

experts in their field, but rather technicians of another
specialty who learned some programming skills. The AFLMC
has since acquired very talented programmers and the quality
of their products has been most noteworthy (as judged by a
recent implementation Air Force wide of the Funds
Requirement Card II automation project).

Question 5

"Can ECC-I be revised to better serve base supply and the
customer?"

To answer this question, a review of the actual ECC-I
application programs was accomplished. The programs were
written in dBASE II^{tm}, and since this researcher has vast
experience in this particular programming language, a sound
analysis is possible.

Although it is common-place in the computer world to
provide "updates" to existing software, this researcher
feels that ECC-I would be best left alone and a new project
initiated. There are several reasons why this finding is
legitimate. The first of which is that the some of the
procedural shortcomings of ECC-I are due in part to the
limitations of the dBASE II^{tm} programming language. This
was Ashton Tate's first attempt at creating a programming
language for their popular dBASE II^{tm} software package.
Later versions provide much more sophisticated programming
tools which would better facilitate some of the more

advanced requirements dictated by the ECC Management application.

The second reason for starting over with ECC Management is that the programs in ECC-I are not coded in a "structured" manner. What this translates into is the programs are very hard to change. Additionally, there is not a fundamentally sound "user-interface" built into the program. All attempts to make ECC-I easier to use would mean wading through many programs to "build-in" this concept. Whereas a new project could be founded upon user friendliness, and every menu or interface would have the same underlying theme.

Summary

Chapter IV has presented the investigative questions and proposed likely analysis of each. The majority of the information contained in this chapter was revealed through the literature search and involved only synthesizing the different works. The overall theme of this research was to identify where exception management fit into the order processing arena and to ultimately determine how it affects customer service -- an idea which was materialized in Chapter II. The results of this study showed that exception management is important to order processing, and that order processing is a vital player in the game of customer satisfaction.

Chapter V will discuss conclusions based on these
findings and recommend additional study areas.

V. Conclusions and Recommendations

It is not possible to conduct a research effort such as this and not arrive at some conclusions and even some recommendations. There are many areas which surface for further investigation, and it is the hope of this researcher that some of the key points may be picked up and examined further. For discussion purposes, conclusions drawn from the research and some of these possible "follow-ons" are presented below.

Conclusions

It is this researchers opinion that the SBSS's method of handling exceptions works impressively well. In fact, even Base Supply personnel feel that the process is sound. Even more importantly, they feel that the whole reason for having exception processing is for the customer. Technical Sergeant David Rockafellow (NCOIC of Base Supply's Repair Cycle Unit at WPAFB) said it best in his statement that "...ECC's are to the benefit of the customer and not Base Supply" (Rockafellow,1991). Further evidence of exception management working well is the statement made by Jodi Taylor (Chief, Customer Service and Training Unit): "...we have never received a customer complaint which could even remotely be traced or tied to exception processing" (Taylor,1991). She went on to say that "...if it weren't for the SBSS's method of managing the various exceptions,

the customer would be in a world of hurt" (Taylor,1991).
This statement was made in reference to the broad category
of exceptions which deal with whether or not the customer
gets issued property (hazardous items for example).

An additional observation which should be noted is that
the SBSS's exception process is only as good as the ECC
Management System employed in the Stock Control Section.
Since they are the ones who insure that correct exception
information is attributed to the correct NSNs, whatever
system they choose to manage the ECC images must be sound.

This notion pointed out above, brings up the third
observation. A new ECC-II automation project is needed.
Currently, there is no standardized method by which to
manage the ECC images. It is not necessary to distribute
the data among all of the order processing sections/units --
just insure the SBSS is kept up to date with a dependable
reconciliation program.

Recommendations

In addition to the above conclusions, several areas for
further research have surfaced. The first of which draws
from the notion that exception management is for the
customer. There are literally hundreds of possible
exceptions to the normal order processing flow. How many
are legitimate and do we need different ones? Could the
customer be better served by a different type of exception?
Are they poorly served by a current one? This topic could

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get quite extensive since it would require validation or justification of all exceptions currently in use by the SBSS, but nonetheless could evolve into a worthy project.

The second recommendation from this research is related to a particular training class offered by the WPAFB Training Section. It involves teaching the customer all about items which are coded Issue Exception Code (IEX) 9. These are hazardous items which require special training/authorization to possess. The class teaches the users (mainly remote terminal operators from other functional areas on base) what to do if the item their request "rejects" from the SBSS because it is coded IEX 9. This is especially helpful to the customer since it allows them to understand what to do if the reject occurs, and it brings attention to the environmental ramifications of the products they use. This researcher recommends this class be studied for potential application Air Force wide.

The third issue which this researcher feels might hold merit is adding the capability of attaching exception description info to each NSN in Sperry 1100/60. If each NSN record in the mainframe could potentially carry the exception information, the need for a stand-alone system to do this very thing would be eliminated all together. This change would involve potentially extensive program which may be prohibitive in itself, but is definitely worth examining.

A final recommendation for further research evolving out of this study is to explore what the customer's perception is of Base Supply's exception processing. It is clear that the customer feels that order processing is important--this fact has been well established. However, little effort has been put forth to ascertain what the customer's viewpoint of exception processing is. Does the customer understand it? What "real" impact does exception processing have on the customer? These questions and more could form the basis of an extension of this research into customers world of exception processing.

Final Comments

This research identified the link between exception management and customer service. It is very rare that such "tedious" functions of Base Supply are actually pinned to the concept of customer service. The proceedings of this document show very clearly that exception management is extremely important to order processing, which in term is very important to the customer and their ultimate satisfaction in the service Base Supply performs.

It is the sincere hope of this researcher that if no other good has become of this effort, at least some lights will be turned on to the fact that everything that is done in the Base Supply organization ultimately impacts the customer's impression of the unit.

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Vita

Captain David W. Jones was born on 30 October 1963 in Slayton, Minnesota. Being from a military family, his early childhood was filled with moves. After settling in Southeast Missouri, he lived in Kennett, Missouri for his school aged years. After graduating from Kennett High School in 1982, he attended Southeast Missouri State University where he received a Bachelor of Science in Computer Science in 1986. Having completed the Reserve Officers Training Course curriculum, he was commissioned an officer in the United States Air Force. The same May, 1986 Captain Jones was married to Lori Ann Kimmer and they currently have two children. He served three and one-half years at the Williams AFB, Arizona 82nd Supply Squadron, and held the positions of Operations Support Branch Chief and Materiel Management Branch Chief. He was selected as Air Training Command's "Outstanding Junior Supply Manager for 1989" and was also recognized as the "Wing Support Officer of the Quarter" in 1988. In May 1990 he entered the School of Systems and Logistics, Air Force Institute of Technology.

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13. ABSTRACT (Maximum 200 words) The purpose of this study was two-fold; the first goal was to determine what the SBSS order processing is, and secondly to determine the effect the current method of ECC management has on the SBSS order processing cycle and the level of customer service rendered by base supply. The research revealed that exception management is a crucial component of a successful order processing function. Further, it was established that the level of customer satisfaction experienced is greatly dependent upon good order processing. Research further indicated flaws in the current method of ECC management and recommended further actions to correct the current method of ECC management. The success of the SBSS order processing function is highly dependent upon a sound system of managing ECC images; however, the order processing functions do not need to be directly involved in the management of the ECCs. Rather, they require the ECC management function to merely keep their mainframe up-to-date with valid ECC information. This study is the first of its kind which links non-customer serving functions of Base Supply to the satisfaction level experienced by supply customers.

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