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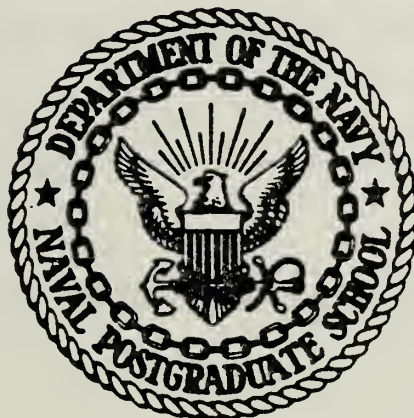
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THESIS

COST-BENEFIT ANALYSIS
UNIVERSAL PRODUCT CODE SCANNER EQUIPMENT
FOR MILITARY COMMISSARY STORES

by

Timothy P. Hudson

September 1980

Thesis Advisor:

W.H. Skierkowski

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Cost-Benefit Analysis
Universal Product Code Scanner Equipment
For Military Commissary Stores

by

Timothy P. Hudson
Captain, United States Marine Corps
B. S., University of Maryland, 1972

Submitted in Partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

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September 1980

ABSTRACT

Military commissaries have long been criticized for poor service, frequent stockouts and excessive queuing. After experiencing similar problems, commercial supermarkets have been experimenting with new techniques to streamline their stores and reduce costs. The commercial grocery industry has pioneered the development of Point of Sales (POS) equipment in order to remain competitive in a market characterized by a low profit margin. Commissaries, on the other hand, have found it necessary to rely upon increased appropriated funds to maintain their cost saving advantage. In light of Congressional attempts to reduce or eliminate the appropriated support, a Universal Product Code (UPC) scanner system was analyzed by way of a cost-benefit analysis using the Fort Ord Commissary as a basis. The financially persuasive results, as well as other attractive nonquantifiable patron benefits indicate that investing in a UPC scanner system could constitute a significant step toward preparation for self-sufficiency, while insuring the preservation of this beleaguered benefit.

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I. INTRODUCTION

The Military Commissary System has long been criticized for its poor service, frequent stockouts and excessive queuing. Many commissary managers are concerned that the situation may deteriorate to the point that commissaries will lose their customers to the better equipped, more modern, fully stocked commercial supermarkets, even though they maintain a low-cost advantage. Explanations as to why this situation is true emphasize cutbacks of personnel as the main problem, with inventory control running a close second.¹

The General Accounting Office (GAO) was recently tasked by Congress to conduct an audit of the military commissary operations. Congress has viewed the large annual subsidy for commissaries with concern. As the military appropriations for defense have grown during the recent inflationary years, so has the subsidy required by the commissaries. Appropriated funds are used to provide for the labor costs of the commissary employees, both military and civilian. Through the Department of Defense (DOD) Civilian Substitution Program, most military personnel have been removed from the commissary stores, thus freeing them for more directly related DOD positions. Therefore, the majority of the appropriated support is for civilian employees.²

The GAO concluded from their audit that the appropriated funds supporting the commissaries can and should be removed or at least reduced, forcing the commissaries to assume more of their own costs. It was further stated that improvements in management and the operation of commissaries were also necessary.³ GAO only echoed what Congress had been expressing for years. Congressional momentum continues to grow in an effort to force the commissaries to begin assuming more of their own expenses, specifically their personnel costs. One of the greatest fears expressed by Congress is that if too much support is removed too quickly, commissaries might be forced into a price spiraling position and eventually be driven out of business.⁴

In that civilian personnel costs are still funded through the Operation and Maintenance (O&M) appropriations, certain budgetary restrictions concerning the hiring and staffing are inherent. As a matter of reference, sales in the Navy commissary stores, between 1962 and 1972, increased 200 percent (unadjusted for price increases), whereas the staffing during that same period increased only 20 percent. This understaffing trend is still prevalent. Another impact on staffing has been the civilianization of military billets, resulting in a loss of available employee working hours. Previously, military personnel assigned to a commissary were available if needed

and were often required to work 50 to 60 hours per week. Man-hours of productivity were lost with civilianization because civilians work a standard 40-hour work week.⁵

Besides Congressional pressure to reduce the appropriated fund support for commissaries, there are currently major problems of a personnel nature, pertaining to military and especially civilian personnel, in all four service commissary systems. These problems have been specifically identified and fall into three categories:

1. Staffing difficulties,
2. Manpower restrictions and controls,
3. Availability of management talent.

These problem areas must be resolved before any reduction in appropriations support can be effected without severely hampering the commissary system.⁶

The present controls over civilian manpower are four-fold. There are limitations on:

1. Dollars allocated to manpower,
2. Actual headcount,
3. Equivalent manpower or man-hours,
4. Restrictions on the number of personnel in each grade and skill assigned to the commissary function.⁷

The problem that results from these stringent and overlapping controls is the operation of the commissaries

in an understrength manpower position. This understrength position creates yet another series of problems, which are:

1. Long waiting lines -- unable to staff cash registers.
2. Difficulty in stocking -- speed of stocking reduced.
3. Excessive overtime required -- particularly in warehouses.
4. Accident rate increased -- due to increase in speed.
5. Low employee morale.⁸

These manpower restrictions and the resultant understrength position, create other problems causing the impact upon the commissaries' ability to provide a service to the patron, and are the direct cause of the high labor turnover experienced in most commissaries. The domino effect of the labor shortages requires the training of additional people. Inventory discrepancies, stockouts, pricing errors and even unmanned checkout stands are attributed directly to labor turnover. Compounding the problem of turnover, is the long lead time to hire and train replacements.⁹

Two major management problems, lack of sufficient personnel and inventory control, have been highlighted as common to all commissaries. Increased funding for additional employees to correct these problems does not appear

to be forthcoming. In view of the limited funds for more employees, commissary management must look to improved technological methods of operation which could provide better management control over inventories and improve customer service, (including speedier checkouts) without an increase in the number of employees.

Several years ago, commercial supermarkets found themselves in a similar situation with essentially the same problems. While commissaries were relying on increased appropriated funds to solve their problems, supermarkets experimented with new techniques to streamline their activity and reduce costs. They became pioneers in the development of Point of Sales (POS) equipment, which is hardware designed to record individual item movement at the time of the sales transaction. Eventually, they adapted Universal Product Code (UPC) scanners.

The retail grocery business was afflicted by penny-pinching consumers, overexpansion and increasing capital intensiveness in a business that was more labor intensive than ever. The cumulative results of all of these trends had driven their traditional profit margin of one percent to two-thirds of one percent.¹⁰ Locked into the extremely competitive environment and afraid to raise prices for fear of the economic results, many grocery chains found that their entire grocery departments had become net money-losers.

These same stores were then forced to subsist on the profits generated from the sale of general merchandise.

At that critical time, the grocery industry turned to the then recently developed UPC scanner technology. Scanners offered the grocers drastic reductions in operating costs, thereby improving the intolerably low margins at no cost to the customer.¹¹

At the heart of the UPC scanner technology, is the Universal Product Code. This code was developed by a committee comprised of grocery industry representatives. After nearly three years of deliberation, the UPC bar code was adopted by the grocery industry in April, 1973. The UPC was designed and adopted only by the grocery industry because of the physical aspects and variety of goods involved in the retail industry.¹² The code is both machine and person readable. The UPC is a numbering system that assigns a unique number to every product currently in distribution. The numbering system adopted for the grocery industry has ten digits of which the first five are assigned to identify the manufacturers and the second five are assigned by the manufacturers to each of the items in his line.¹³ Vertical bars and spaces make-up the UPC scannable symbol, while numerals directly below permit human reading. The UPC symbol can be preprinted on all forms of packages in various sizes and colors, and can be read by several types of devices known as scanners.

It is estimated that 95 percent of the grocery items in a store contain UPC's and manufacturers and processors of grocery products are adding the UPC symbol to more items each year.¹⁴ For variable weight products, such as meat and produce, a number of equipment manufacturers have developed and are now marketing scales that print UPC labels with the price encoded in the symbol.¹⁵

Associated with the scanner and also located at the checkout stand, is an Electronic Cash Register (ECR). These cash registers are not stand-alone devices, but are controlled by a processor which is normally housed in an office adjacent to the checkout area.¹⁶ Except for variable priced items, such as meat and produce, the UPC is only a code and does not contain an item price. During checkout, the scanner, ECR and processor work in consonance to form what is known as a price lookup system. The system operates with item records residing on a disk file located at the processor. During checkout, the cashier passes the UPC labels across the scanner. Entry of this item code causes the system to automatically access the file and uniquely associate the item number with its record which contains the unit price. Once the code is matched to the record, this data is transmitted back to the ECR where the price is displayed and sales slip printed. Information on each item record ensures that the customer is properly

charged for the merchandise and that the retailer collects the full amount of the sale. The system is designed to automatically charge for bottle deposits, validate coupons and ascertain food stamp eligible products.

When Universal Product Codes were developed, it was intended that these codes, along with the scanners would help the retail grocery industry regain their failing profit margin by serving several purposes:

1. To eliminate prices on individual items.
2. To reduce the number of people and costs related to the task of pricing goods.
3. To gain better control of the vast inventories of products.
4. To improve the ordering system.
5. To improve profits of individual and chain stores.¹⁷

When scanners were initially introduced, they were immediately embroiled in a wave of controversy. Consumer activists charged hysterically that the grocers, who wanted to list prices on the shelf, were conspiring to raise prices secretly by computer. Half-a-dozen states rushed to pass laws requiring that prices be stamped on every item sold.¹⁸ The Retail Clerks Union, fearful that price removal meant the loss of jobs for many Union members, also actively opposed scanners.¹⁹ Recently, however, the Union dropped its opposition to scanners when it was determined that the growth in the retail food industry more than compensated

for the loss of jobs caused by scanners. Consumer groups who previously opposed scanners, now see them as a way to reduce food costs since much of the store savings and benefits associated with scanners have been passed on to the customers.²⁰

Scanning was never envisioned or promoted as a customer benefit. Rather, it was seen as a management tool and an operating necessity. However, better customer service has been the foundation of customer acceptance.²¹ Consumers have been impressed with several soft benefits that apply directly to them:

1. Faster checkouts -- less time in lines.
2. More detailed and informative customer receipts.
3. More accurate checkouts.
4. Better selection of merchandise due to accurate inventory control.²²

In conclusion, commissaries are presently experiencing serious problems which detract markedly from the mission of the commissary to provide a convenient source of food. At this same time, Congressional momentum is growing to force the commissaries to become more self-sufficient. Commissaries must become more efficient; not only in their use of their scarcest resource, personnel, but also in their control over inventories lest future economic pressures drive them from existence. The potential savings from

upgrading their present equipment to scanning devices has been demonstrated by the commercial sector and can be calculated for commissary stores.

The purpose of this thesis is to examine the prevalent operating problems currently experienced by military commissaries and to determine if a technological innovation, developed for commercial supermarkets (UPC scanners), could be employed to reduce costs and improve customer service. An enhanced, self-sufficient commissary system today could ensure the preservation of this benefit if appropriated funds should be reduced or eliminated in the future.

The next chapter discusses the background of commissaries, specifically covering their inception during early frontier times; recent budgetary efforts to eliminate their annual appropriated support; and the current mood of Congress to reduce the large annual appropriation while striving to preserve this benefit.

The third chapter is a review of current operations, and a cost-benefit analysis of scanner equipment. This chapter includes specific costs of procuring, installing and servicing the basic scanning equipment, as well as the savings generated by such an investment. The last chapter covers additional equipment that may at some future date be considered to further enhance the initial scanner system, enumerating the hard and soft benefits to be realized by both commissary management and patrons.

The commissary located at Fort Ord, California was the primary source of information for this thesis; however, data from any commissary could have been substituted and the cost savings and ancillary benefits that a UPC scanner system provides, would still be duplicated.

II. BACKGROUND

In 1825 Congress originally authorized the United States Army to sell food and other subsistence items at cost to officers stationed at isolated frontier posts, thus creating the first commissary stores. In 1866 this authority was expanded to include enlisted personnel. Soon thereafter, the Air Force, Navy and the Marine Corps were permitted the same privileges.

Congress had originally authorized subsistence items to be sold at cost only in certain isolated areas where facilities for food at reasonable prices were not available. Despite reiteration of this original intent of Congress by Congressional Committees, the Department of Defense had established 210 commissaries in the United States by 1953, and their number has grown by one-third since then.²³ In fact, in 1977 DOD described the commissary system as a widespread big business with vast operations located in metropolitan areas, and in most cases where adequate commercial facilities were available. In 1978 there were 260 commissary stores operating in the United States. Table (1) illustrates the number of commissary stores and their total sales by service for fiscal year 1978.

Number of DOD Commissaries in U.S. by Service
and Total Sales for the Fiscal Year 1978²⁴

	<u>Stores</u>	<u>Total Sales In Millions</u>
Army	72	857.2
Navy	60	466.2
Marine Corps	12	89.1
Air Force	<u>116</u>	<u>1,162.2</u>
TOTAL	<u><u>260</u></u>	<u><u>2,574.7</u></u>

The commissary system operates supermarket type grocery stores primarily for families of both active duty and retired military personnel and for certain civilian personnel. Commissaries can sell groceries, meats and produce at prices averaging about 25 percent less than commercial supermarkets. The principal reasons for this include the fact that their operating costs are subsidized by appropriated funds and that they are exempt from most taxes.²⁵

As stated earlier, Congress has repeatedly reinforced its original intent that subsistence items be sold only where they are not reasonably available from commercial sources. In 1953, Congress reemphasized its intent that commissaries are justified only at remote stations and require the Secretary of Defense to annually certify the need for such facilities. Each year since 1953, as required by DOD appropriations acts, the Secretary of Defense must authorize each commissary by certifying that "items

normally procured from commissary stores are not otherwise available at a reasonable distance and a reasonable price in satisfactory quality and quantity." The certification is based upon a survey using criteria established by DOD in 1949 and is based upon three areas:

1. Convenience criterion - commercial stores are too far from the installation.
2. Price criterion - commercial store prices are too high.
3. Adequacy criterion - stores do not carry a full line of goods similar to a commissary.²⁶

The justification of the United States commissary stores has come under intense Congressional scrutiny in recent years. The General Accounting Office was called upon to examine the 1979 survey that the Department of Defense used to certify the need for 258 U.S. commissaries. Their report stated that none of the commissaries were justified solely on the basis of adequacy and only one was justified on the basis of convenience. The interest that Congress has recently shown toward the commissary system goes deeper than the debate over what stores are justified and which stores should be closed. At the heart of the issue is the direct appropriated fund support authorized annually by Congress to subsidize commissary operations.²⁷

In fiscal year 1979, the direct subsidy to commissaries was 28.7 percent or \$77.7 million higher than the 1975 direct subsidy. Congress realizes that most of the increase

in funding was a result of inflation, but has urged the Department of Defense to moderate its large annual budget increases by eliminating programs of marginal value in maintaining the combat capabilities of the Armed Forces. The specific intent of Congress was for the DOD to initiate plans to reduce, and ultimately eliminate, the direct appropriated support offered U.S. commissaries.²⁸

In response to the mounting Congressional concern over the funding of commissaries, the Secretary of Defense, through a Program Budget Decision, instituted a study group to determine what changes, if any, should be made to the commissary organizational system and operating structure. The study group concentrated on improvements in efficiency, reduced costs and better service to the patrons. It was assumed at the time of the study that appropriated fund support for personnel would soon be withdrawn. The group found that with the withdrawal of appropriated funds, the savings to the commissary customer would decrease by at least 10 percent. Considering the Congressional concern and armed with the study group report, the Department of Defense proposed in its fiscal year 1976 Budget the elimination of appropriated funds for wages and salaries of commissary employees. During extensive Congressional hearings, this proposal was strongly opposed by patrons and suppliers of commissaries. Responding to the opposition, Congress

reestablished the appropriated funds voluntarily omitted from the DOD Budget. Again, the Department of Defense, in its fiscal year 1977 budget submission, eliminated the request for appropriations for specific commissary operations, but again Congress reinstated those funds. The fiscal years 1978 and 1979 budget submissions were not without incident. Although DOD did not duplicate its reduced funding request, both Houses of Congress took exception to the level of appropriated fund support for commissary operations.²⁹

Congressional intent to remove appropriated fund support and force the commissaries to be more self-sufficient is well founded. Commissaries have long been viewed as a substantial economic entity with the ability to assume more of their own costs. Commissaries today are one of the ten largest retail food sales organizations in the country with annual sales of over \$3 billion. In addition, commissaries annually receive direct and indirect subsidies estimated for fiscal year 1979 to be over \$544 million; \$394 million for operating support and more than \$150 million through exemptions from Federal and State income taxes, as well as state and local sales taxes. They also receive undetermined amounts of indirect subsidies from the free use of real property and attendant services. Commissaries, because of their large sales volume, are able to pass on to their patrons over \$840 million a year in savings.³⁰

As previously stated, Congressional committees and members of Congress have been concerned with the increasing DOD Budget; specifically, the rising commissary subsidy costs. Congress has not yet reduced the appropriated fund subsidy, but on many occasions committees and members of Congress have either directed or strongly stated that the subsidy must be reduced through more efficient management and operating techniques. Congressmen, as a whole, have not been swayed by the argument offered by the services that the commissary has become an implied fringe benefit. Before 1967, the services treated the commissary fringe benefits as a factor in determining the need for and amount of pay raises. However, the first Quadrennial Review of Military Compensation Panel, which was responsible for recommending military pay reforms, recognized in its 1967 Report that the commissary benefit was no longer an appropriate element of compensation because it provided unequal benefits to military personnel and it would be an impractical obligation on the part of the Government. The Panel's Report further stated that the value of commissaries to military personnel varied considerably depending on family size, income levels, availability of and access to commissaries, and individual family consumption preferences. In conclusion, the Panel believed that if the commissary benefit were considered an element of compensation, then DOD would be placed in a position of paying cash to military personnel who did not have access to a commissary.³¹

GAO contends that DOD does not have a moral commitment to provide commissaries to retired military personnel, nor have they shown that commissaries are a substantial inducement for recruiting or retaining qualified individuals. The most recent Congressional thrust has not been toward eliminating the commissary system, but in reducing and ultimately eliminating the funding support for civilian personnel. Congress is now aware of a potentially adverse affect of their attacks on the commissary system that DOD has been aware of for years.

If appropriated funds are removed, Congress contends, the savings may be illusionary. The concern now is that a spiraling effect may take place in many commissaries. The proposed changes in the operation of the commissaries, such as requiring them to suddenly absorb the personnel costs, would necessitate an increase in either the surcharge or the cost of goods sold. This increase in cost would drive many patrons to commercial food stores and leave fewer commissary customers to bear the increased costs. This situation is believed to eventually lead to a spiraling effect which would escalate prices to a level where patrons would be indifferent or even prefer to shop in the traditionally more modern, spacious, well-stocked commercial food stores.

To better understand this spiraling effect and its impact on costs, an assessment of actual savings and perceived savings is critical due to the effect on sales that a reduction

in savings may have. Actual savings are ascertained on a periodic basis by way of a triennial survey which is conducted within the United States (including Hawaii and Alaska) by DOD. The survey consists of a market basket of 89 food items which are selected to correspond to a family's food buying practices. Items on sale in both commercial supermarkets and commissaries (voluntary price reduction items) and troop issue items, which are somewhat equivalent to supermarket house brands, are excluded. The results of these surveys have been challenged in some quarters because the price comparison surveys are made by comparing national brand merchandise. The rationale is that the commissary store patrons could buy commercial house brand merchandise, rather than national brands, at a reduced price. It is also projected that specials and loss leaders are not taken into consideration. The rationale continues that the real savings in military commissary stores may be three to five percent below that which is reported in the triennial surveys.

At the request of the study group formed by DOD to conduct a detailed report on commissary operations in 1975, a special survey was conducted. As a result of the survey, it was determined that actual average savings to commissary customers was 22 percent.³² A more recent study, also conducted by DOD, took place in 1979 with results that indicated a savings of 25 percent was then afforded commissary

customers. The increase in savings between 1975 and 1979 is attributed to increased operating efficiencies generated by the separate services' attempt to consolidate their commissary operations.³³

Actual savings are important, but people base their decisions on perceived savings. In an effort to quantify what military personnel actually perceive commissary savings to be, several separate studies were conducted. The conclusion that was drawn from a review of these studies is that many commissary store patrons believe that the savings achieved by buying in military commissary stores are less than they actually are. For example, 27 to 35 percent of the persons surveyed DOD wide, perceived savings to be less than 10 percent. Therefore, reducing savings by 10 percent could mean that these customers would be opposed to shopping in military commissary stores causing a significant loss in sales and thus, the beginning of the spiraling effect previously mentioned. The eventual result would be closure of many commissaries that Congress has insisted it is interested in protecting.³⁴

In conclusion, this chapter has dealt with the history of the commissaries dating back to early frontier times, the specific appropriation language that authorized the military to operate commissary stores and recent Congressional action to reduce commissary operations. Of particular importance recently has been the Congressional concern

over the continued large annual appropriated fund support to such stores. Congress has indicated that it has no intention of closing any commissary stores, yet is concerned that a move at this time to eliminate appropriated funds and force the commissaries to be self-supporting, would trigger a spiraling effect that would eventually result in the closure of many stores. In order for commissaries to continue to offer savings to patrons, it is imperative that more efficient operating techniques be instituted to compensate for the eventual increase in costs.

Commissaries today are in the same position that large commercial grocery stores were in several years ago. The solution that many of them optioned to take at that time was the installation of Point of Sales (POS) systems. Recent improvements in reliability and a reduction in unit cost through continuing research have made POS systems an affordable and positive step toward preserving commissary benefits in the wake of reduced appropriations needed to support these facilities.

In the next chapter, a Point of Sales system will be introduced and a cost-benefit analysis, using the commissary at Fort Ord for its basis, will be structured to show operating benefits and relevant costs for procuring, installing and maintaining a UPC scanner system.

III. PRESENTATION OF DATA AND SPECIFIC APPLICATION

In recent years, commissary stores have been afflicted with the same problems that commercial supermarkets have experienced. One of the most prominent of these problems being the requirement to provide a quality service in view of the limited manpower resources in a labor intensive industry. Commissary management, for the most part, consists of individuals experienced in retail grocery operations who are intensely interested in providing the overall grocery food needs of the Armed Services. Commissary management, aware of current problems, is now investigating possible solutions.

Universal Product Code scanners are a tried and tested product developed expressly for the retail food industry. Although scanners were initially developed to improve profits for the beleaguered commercial supermarket industry, the unforeseen spinoff from scanners has proven to be a real boom to consumers in the area of soft benefits.³⁵ Commissaries, as a whole, have been conservative insofar as ventures in high technology devices that promise an overnight return on the investment. Both the scanner equipment and Universal Product Codes have undergone continuous development for many years and the initial flaws and criticisms surrounding these devices have been eliminated.

Modifications and improvements of scanner equipment have made them more reliable and efficient. At the same time, innovations in the area of laser technology have led to reductions in prices of UPC scanning equipment.³⁶

Initially, UPC's themselves proved, in many cases, unreadable. Industry pressure forced food processors and manufacturers to improve the quality of their UPC labels or suffer economic setbacks as scanner equipped supermarkets refused to stock "unreadable" merchandise.

Considering the reduced prices and improved reliability, it is presently financially advantageous for commissaries to initiate the upgrading of their present checkout equipment and begin reaping the benefits that scanner equipped commercial supermarkets enjoy. Also, with the benefits of the Armed Services apparently eroding, it is important from the standpoint of the commissary patrons that improvements in the present daily commissary operations are necessary, warranted and desired, thus ensuring that this benefit does not also pale from existence.

The remainder of this chapter is structured as a cost-benefit analysis. Specific, relevant costs associated with procuring, installing and maintaining scanner equipment will be presented. The estimated benefits from such equipment will be compared to its cost in an effort to establish a payback period for recoupment of the original investment. This chapter will also include the addition of ancillary

equipment necessary for installation and operation of the UPC scanner equipment. Included in the cost-benefit framework will also be a sensitivity analysis for various investment decisions. As previously stated, this analysis was conducted using the commissary data extracted from the U.S. Army Commissary located at Fort Ord, California. The physical description basically resembles any large commissary operated by the Armed Services; plus, the scenario of operating problems and constraints are indicative of those problems each military commissary is now facing.

A. DESCRIPTION

The commissary at Fort Ord is a relatively new facility compared to other commissaries operated by the Armed Services. The store contains 23,000 square feet of sales area enabling the commissary to carry in stock 7,800 items. Warehouse space, adjacent to the sales area, occupies another 23,000 square feet of floor space where an estimated two-weeks supply of each item is maintained. The sales space, plus the adjacent warehouse, enables the commissary to carry an average inventory of over \$1 million. Several commercial distribution firms are under contract and provide the inventory and transportation of the bulk of the stocked items. The remainder of the items are obtained through Direct Store Deliveries (DSD). DSD items include such areas as various

brands of soda, potato chips, bread and dairy products. DSD vendors actually enter the sales area and restock shelves with their items.³⁷

The commissary is configured with 15 checkout stands, all equipped with Electronic Cash Registers. The cash registers are controlled by a data processor which is located in the store office. Two hundred of the most frequently purchased items (usually basic food items) are coded into the processor in order to accelerate checkout procedures. When a cashier encounters one of these items, a code up to three digits corresponding to the item is entered by way of the ECR keyboard. The item price is retrieved from the processor and appears on the ECR digital sales display. The processor is also programmed to calculate the commissary surcharge on each purchase total, validate coupons, redeem food stamps and total and date the sales receipt. Any changes in data such as date or price of a coded item is accomplished with an input device located next to the processor. The Supervisor is trained and authorized to make such changes. Mistakes in "ringing up" a customer's order, when discovered, are time consuming to verify. A standard procedure in effect requires an additional sales person to move the total purchase to the office where the previous total is verified via a calculator.

Lines are often formed outside the commissary as patrons wait for grocery baskets. The Fort Ord Management has

specifically limited the grocery baskets available to 225. If more baskets were available, movement once inside would be clogged to a standstill. It is assumed, of course, that most of the people entering the commissary require more items than can be carried by hand and, therefore, must wait for a basket. Even with limiting the baskets to 225, the lines from the checkout stands often extend down the grocery isles. When this condition occurs, the resulting massive tieups of shoppers prevent store employees from restocking depleted shelves. Restocking commences when the lines subside or in extreme circumstances, the following morning, as no restocking is performed after normal store hours. A physical inventory is taken once a quarter requiring the store to close one business day in order to accomplish this. Total dollar amount of unexplained losses are determined from the physical inventory at that time.

All items in the store are sold at cost which includes transportation to the commissary. Sales are broken down into three main commodity areas: grocery items, meats and produce. These commodity areas represent 72, 24 and 4 percent of sales respectively.³⁸ No quantity discounts are available through the distributors, however, reductions in price are offered if it is determined that a distributor has overstocked a slow moving item, thus tying up storage and sales space. The prices for meat and produce change

frequently to reflect current purchase prices dictated by market influences for these commodities. Because spoilage and trimming losses are inherent in these two areas, further "in house" price adjustments are made in order to recoup costs. Operating expenses, not to include labor costs, are financed through a four percent surcharge of the total purchase price. This required surcharge more than offsets the total operating expenses at Fort Ord.

The revenue generated from the surcharge is controlled by the Service Branch Headquarters for each commissary system. The residual above operating expenses is used service wide to fund equipment replacement/procurement, modernization programs and new construction. Inventory costs are funded through the Commissary Trust Fund, a DOD stock fund. This is a revolving type fund which is reimbursed when the inventory is sold by the commissary stores.³⁹

B. CRITERION

The criterion used to evaluate the scanner system was the cost to procure, install and operate this system for a five-year period. This length of time was chosen because it represents a window within which the system could be fully operational and not require replacement of any equipment, thereby compounding the analysis. The scanner system will be analyzed in terms of a cost savings resulting from increased accuracy of checking out items at the exact price

intended. Although scanners are often touted for their ability to reduce or alleviate the problem of frequent stockouts, excessive queuing and poor service, these areas are considered nonquantifiable for this evaluation. In addition, since the cost of civilian labor is presently provided through appropriated funds authorized on a yearly basis, labor costs have not been considered an expense to the commissaries in this analysis.

C. EFFECTIVENESS

The effectiveness analysis has been structured around the cost savings which UPC scanners could provide. Scanners were originally developed for large grocery chains which have traditionally been extremely competitive. This competitiveness is evidenced by their usual one percent profit margin. In recent years, grocers, caught in the squeeze produced by inflation, increased consumer awareness and stiffer competition were enthusiastic about the development of the scanner which offered the possibility of increased savings which in turn would be used to their competitive advantage by reducing prices.

Scanners offer many benefits, from nonquantifiable soft benefits to hard dollar savings such as checkout accuracy and inventory control. A recent industry survey of scanner-equipped retail grocery stores revealed that a hard dollar savings, attributed to increased checkout accuracy, could be

expected immediately in stores that installed the scanner equipment.⁴⁰ The increase in accuracy was the result of prices being determined from scanned codes vice manual keyboard entry. "Misrings", errors when punching keyboard cash registers, mismarked items, as well as misread prices have always been a problem in the retail grocery industry. Cashiers, who tend to identify with the consumer, are often thought to sympathetically shave prices on items. Customers will correct cashiers who error in the store's favor, but seldom point out an error when in the customer's favor. Most errors, however are attributed to innocent errors on the part of the cashier. Regardless of the reason, this high level of inaccuracy during checkout results in a distinct disadvantage to the store.

Concern over errors during checkout has forced the commercial industry to institute in-house checkout tests to ensure the continued accuracy of the checkout clerk. Some commercial chains, aware of the checkout error rate, have instituted unannounced spot inspections by unidentifiable company representatives. The commissaries have likewise adopted a checkout test which is administered on a periodic basis. Unlike the commercial supermarkets unannounced inspection, these checks are conducted usually by the Deputy Commissary Manager. Although these inspections are basically structured to ensure correct operation of the checkout stand, a considerable reduction in checker speed

is noted during these tests in an apparent attempt by the cashier to ensure accuracy. It was not until the advent of the scanners that the extent of the inaccuracies stemming from the use of keyboard cash registers could be calculated.

One of the leading manufacturers of scanning equipment, National Cash Register (NCR), conducted an industry survey of UPC scanner-equipped supermarkets to determine the savings that could be realized when scanner equipment was implemented. The results of the survey indicates that a savings from .2 to 1 percent of sales could be realized and an overall industry average of .4 percent was calculated.⁴¹ Because the industry survey was conducted by a manufacturer of scanner equipment, who may have inadvertently biased the results, a sensitivity analysis has been included in Section E where the expected percentage of savings has been varied.

The Navy equipped several East Coast commissaries with scanners several years ago and has conducted similar studies to ascertain the savings afforded from the increased check-out accuracy after implementation of the system. Their results indicate that the amount of savings to commissaries was similar to the amount obtained by the commercial supermarket analysis; and that the industry average of .4 percent of sales represented a good measure of the overall savings obtained from their analysis.

In the above mentioned studies, savings were based on a percentage of sales. The sales figure refers only to the

percentage of scannable sales vice total sales. For the savings analysis that follows (Figure 3-1), it is important to distinguish the various percentages of scannable items. Scannable items are those items which have UPC's affixed somewhere on the product. While 95 percent of all grocery items are scannable, only 72 percent of the sales at Fort Ord are grocery items. The remainder of the sales are broken down as follows: 24 percent meat and 4 percent produce.⁴² These percentages vary slightly from commissary to commissary, but appear to remain constant over time. During fiscal year 1979, the Navy calculated that sales from its worldwide commissary operations were composed of the following portions: 73 percent grocery, 22 percent meat and 5 percent produce.⁴³ The Navy results are offered merely as a comparison. The analysis is based on those percentages experienced at Fort Ord.

Total sales at the Fort Ord commissary for fiscal year 1979 were \$26.6 million before the surcharge. For the calculations that follow, it is assumed that the total yearly sales for the next five years are constant and are only affected by inflation. In actuality, the sales records indicate a slight real growth in sales before inflation. In recent years, inflation has played a significant part in food prices, therefore, a five percent inflation rate has been included in the calculations and compounded annually.⁴⁴

The "base year" referred to in Figure 3-1, represents the first year that scanners are installed which obviously, would be some year beyond fiscal year 1980. For ease of calculation, it is assumed that the base year sales would only be \$26 million. The base year sales figure along with the other assumptions above, have been extremely conservative in order to avoid extrapolating results that would tend to make the analysis biased toward the eventual savings calculations. In that the initial equipment investment would only enable the commissary to scan 95 percent of the grocery items, which compose 72 percent of the sales, consecutive discounting calculations have been included into the analysis. In accordance with DOD instruction, a 10 percent discount rate has also been incorporated.⁴⁵

Figure 3-1 indicates that the total expected savings resulting from the implementation of UPC scanners would provide a discounted savings of \$309,843 in a period of five years. Not included in this analysis, however, is a monthly maintenance contract cost associated with the scanner of \$21 or \$3,780 per year ($\$21 \times 15 \text{ scanners} \times 12 \text{ months}$).⁴⁶ The discounted cost of maintenance for a five-year period would equate to \$15,037 [$\$3,780 \times 3.978$ (10% Annuity Factor)] and, therefore, actual savings, reduced by the maintenance contract expense, would total \$294,806.

SAVINGS OFFERED BY SCANNING
 BASED ON INDUSTRY AVERAGE SAVINGS OF
 .4 PERCENT OF SALES

	BASE YEAR	2	3	4	5
SALES	\$26,000,000	\$27,300,000	\$28,665,000	\$30,098,250	\$31,603,162
SCANNABLE GROCERY ADJUSTED SALES .684	17,784,000	18,673,200	19,606,860	20,587,203	21,616,562
SAVINGS .4% ON SCANNABLE SALES	71,136	74,693	78,427	82,349	86,466
10% DISCOUNT RATE	.954	.867	.788	.717	.652
DISCOUNTED SAVINGS	67,864	64,759	61,800	59,044	56,376
TOTAL 5 YEAR DISCOUNTED SAVINGS					309,843

SOURCE: Data computed from operating figures obtained from Ft. Ord, California

NOTE: Discount rate extracted from Department of Defense Economic Analysis Handbook, Second Edition.

FIGURE 3-1

D. COST ANALYSIS

The cost analysis for the scanning equipment was obtained from the NCR Western District Manager for Federal Systems, who personally surveyed the specific equipment needs at the Fort Ord Commissary.⁴⁷ The cost analysis has been specifically limited to the scanner equipment manufactured by the NCR Company because Fort Ord recently upgraded their older mechanical cash registers to newer NCR Electronic Cash Registers. NCR manufacturers a scanner which can be added to this ECR equipment. At the time these ECR's were installed, a data processor necessary for the ECR operation was also installed. This processor, the most expensive piece of equipment for either ECR or scanner operations, is already operational at the site; therefore, the present system would very simply be upgraded to a scanner system. The investment required would include the cost of scanners for all checkout stands (including the express lane) and certain additional monitoring equipment to be enumerated later. Commissaries request money for upgrading equipment from each separate service commissary headquarters on an "as required" basis. No present value computations were performed on the equipment costs as this would be paid for as soon as the scanners passed an acceptance test administered by commissary management. Previous scanner installations performed by NCR were accomplished over a weekend which is the standard approach

to upgrading commissary equipment. By performing the installation over a weekend (Sunday evening through Tuesday morning) no store closure would be required.⁴⁸

The last item of cost to be considered in order to complete the analysis, is the preparation of a suitable platform onto which the scanner could be installed. Dedicated wiring was installed at the time of the ECR installation linking each checkout stand with the processor, therefore, no other wiring of this sort would be required. The scanner unit does, however, require a specially designed and built checkout stand where it is based. The present stands contain two rubber motorized belts. One belt forward moves the groceries toward the cashier where the item is "rung up" (hand key-punched on the register). The second belt rearward of the cashier, moves the items away from the cashier and toward the bagging area. The UPC scanners are installed flush with the surface of the checkout stand between the forward and rearward belt in an area known as the belt cover plate. The stand upon which the ECR sits is not part of the checkout stand. During the checkout process, the cashier merely slides the Universal Product Code, which is affixed to the item being purchased, over the scanner window. Modification of existing stands is possible, but not without considerable expense. A modification would require venting the lower area of the stand to reduce heat buildup while the scanner

is operating, as well as separate wiring provided to link the scanner to the ECR. Checkout stands, which are designed and upgradable for scanners, are 1 to 1-1/2 feet longer than ordinary stands. This is the result of lengthening the belt cover plate, the area where the scanner is actually positioned.

Unique to this situation is the fact that Fort Ord's Commissary is currently requesting funds, from the Army Commissary Headquarters, to replace the present checkout stands because of their worn-out condition. Replacement stands for the 15 checkout areas needed will cost \$28,385. For an additional cost of \$4,894, the manufacturer will substitute scanner adaptable stands for the conventional stands. The total cost would then be \$33,279.⁴⁹

Scanner adaptable stands have a removable panel covering the scanner mounting area. These stands with the cover panel installed could be used in a conventional manner until such time as the scanners are procured. Because the checkout stands are due for replacement soon, and scanner adaptable models are available, only the additional cost of substituting scanner adaptable stands for conventional stands was included in the cost computations in Figure 3-2. Although unlikely, this analysis will not rule out the possibility of shortsightedness on the part of the Commissary Management, therefore, a more detailed analysis employing sensitivity analysis computes the total cost using a "worst case"

COST OF EQUIPMENT AND INSTALLATION
OF SCANNER SYSTEM

Cost Per Scanner		
Minus Federal Discount	\$ 3,558	
 Number of Checkout Stations	 <u>15</u>	
		\$53,370
 Addition to Processor Equipment Requirements		
Added Memory	\$10,500	
Disc Storage Device	<u>6,000</u>	
		16,500
 Installation Cost		5,000
 Incremental Cost Associated With Procurement of Scanner Adaptable Checkout Stands		 <u>4,894</u>
 Total System Requirement		 <u><u>\$79,764</u></u>

SOURCE: Sullivan, J. P., NCR Corporation
McCoy, D. L., Lozier Store Fixtures

FIGURE 3-2

situation in which it is assumed that the checkout stands, as well as the cost of scanner equipment is required to make the system operational.

E. SENSITIVITY ANALYSIS

UPC Scanners could be procured and fully operational during fiscal year 1981, and the investment decision could be phased to coincide with the replacement of the checkout stands. The total system requirement would amount to \$79,764 if the decision is made to replace the present checkout stands with scanner adaptable stands. If implementation is delayed and checkout stands, as well as scanners are required a total investment of \$108,149 (\$74,870 + \$33,279) could be expected. The effectiveness analysis is based on the savings provided by the increased accuracy of the UPC scanners. A previous analysis (Figure 3-1), employing a discount rate was included and it was assumed then that the cost savings would be .4 percent, which was based on a surveyed industry average. Two sensitivity analyses have been included as Figures 3-3 and 3-4, to illustrate the attractiveness of the scanner investment. Both analyses vary the percentage of expected savings from a low of .2 percent to a high of one percent.⁵⁰ These savings figures were extracted from a previously mentioned industry survey of scanner equipped commercial supermarkets. The adjusted sales (scannable groceries) data was taken from the previous

ANTICIPATED SAVINGS OF .2 PERCENT
OF (SCANNABLE) ADJUSTED SALES

	2	3	4	5
ADJUSTED SALES (SCANNABLE)	\$17,784,000	\$18,673,200	\$20,587,203	\$21,616,562
SAVINGS .2%	35,568	37,346	41,174	43,213
DISCOUNTED SAVINGS	33,932	32,379	29,522	28,175
MINUS DISCOUNTED MAINTENANCE COST	3,606	3,277	2,710	2,465
NET SAVINGS PER YEAR	30,326	29,102	26,812	25,710
TOTAL NET SAVINGS				139,871

SOURCE: Data computed from operating figures obtained from Fort Ord, California.

NOTE: Discount rate extracted from Department of Defense Economic Analysis Handbook, Second Edition.

FIGURE 3-3

ANTICIPATED SAVINGS OF ONE PERCENT
OF (SCANNABLE) ADJUSTED SALES

	2	3	4	5
ADJUSTED SALES (SCANNABLE)	\$17,784,000	\$18,673,200	\$19,606,860	\$20,587,203
SAVINGS 1%	177,840	186,732	196,069	205,872
DISCOUNTED SAVINGS	169,659	161,897	154,502	147,610
MINUS DISCOUNTED MAINTENANCE COST	3,606	3,277	2,979	2,710
NET SAVINGS PER YEAR	166,053	158,620	151,523	144,900
TOTAL NET SAVINGS				759,571

SOURCE: Data computed from operating figures obtained from Ft. Ord, California.

NOTE: Discount rate extracted from Department of Defense Economic Analysis Handbook, Second Edition.

FIGURE 3-4

PAYBACK ANALYSIS

Savings Accruing from Increased Accuracy
Amount to .2% of Adjusted Sales

	INITIAL OUTLAY	TOTAL SAVINGS	PAYBACK IN FIVE YEARS
CASE I Checkout Stands Not Required	\$ 79,764	\$139,871	1.75
CASE II Checkout Stands Required	108,149	139,871	1.29

Savings Accruing from Increased Accuracy
Amount to 1% of Adjusted Sales

	INITIAL OUTLAY	TOTAL SAVINGS	PAYBACK IN FIVE YEARS
CASE I Checkout Stands Not Required	\$ 79,764	\$759,571	9.52
CASE II Checkout Stands Required	108,149	759,571	7.02

SOURCE: Data extracted from Figures 3-3 and 3-4.

FIGURE 3-5

effectiveness analysis contained in Figure 3-1, with an extra computation showing the discounted effect that maintenance costs would have on savings. The analyses also assume that the maintenance contract cost would not be required until the end of every year. Figures 3-3 and 3-4 illustrate that a total net savings of \$139,871 and \$759,571 respectively could be realized, depending upon the actual savings that Fort Ord will experience after installation of a scanner system. Figure 3-5 uses the estimated savings previously mentioned to compute the number of times that the original investment would pay for itself in five years.

In this analysis, the payback period is computed using cost information from each of the two cases. Each case is representative of the initial investment required to make the system operational. Case I shows the total cost if scanner adaptable stands are procured during the normal course of replacing the worn-out stands. Case II considers the possibility that replacement stands procured to replace worn equipment are not scanner adaptable and, therefore, would be considered a sunk cost.

In conclusion, this chapter has enumerated the costs associated with the purchase, installation and maintenance of a scanner system for the commissary at Fort Ord. Several varying benefits in terms of savings were also explored. Although it is unlikely that the actual savings generated

from the operation of the scanner system would fall on either extreme of possible savings, the analysis points out the attractiveness of investing in this new system. Considering the "worse case" situation, the scanner system can be expected to return its original investment in less than five years.

IV. ADDITIONAL BENEFITS

Chapter III detailed the basic UPC scanner system equipment needs, as well as the costs and basic monetary benefits to be derived from that equipment. This chapter will describe additional hard and soft benefits that can be realized after the installation of a scanner system. Hard benefits such as the installation of additional equipment that permits meat to be scanned and/or the institution of a price removal program, generate marked further savings. With the addition of a printing device attached to the processor, limited management reports can be generated to assist in the increasing problem of inventory control. The last section of this chapter will deal with several soft benefits provided to the patrons after the implementation of a scanner system.

A. HARD BENEFITS

1. Scales

In recent years, commissary stores, as well as commercial supermarkets, have withdrawn from using carcass beef for two reasons: mainly, because of the shortage of qualified butchers who could properly cut and process the beef into family-sized portions; and secondly, to preclude the potential for large losses that resulted if a mistake was made while cutting the carcass, thus turning an expensive cut of meat into scraps.

The meat that arrives at most commissaries has been partially butchered into manageable sections which are further cut and trimmed by the meat department, into family/meal size portions. The commissaries then package the meat with a machine that wraps, weighs, labels and prices the meat, thus completing the process of preparing the meat for sale.⁵¹

These packaging machines are specialized equipment which perform all the functions described above. The precut meat, which has been arranged on a cardboard or plastic tray, is placed into the machine at one end where it is wrapped and moved via a conveyor belt through a sealing unit and onto the scale. At this point, it is weighed and this information is instantaneously transmitted to a printing unit located on the scale where weight, price per pound and total price are printed on a label. The labels are then removed mechanically from the printer and placed on top of the meat package. The completed packages are then dropped into a bin and the wrapping and weighing of other packages continues. Although these machines function as a unit, they are actually two or more units connected by way of conveyor belts.

Several well-known scale manufacturers have developed the specialized meat-wrapping equipment described above.⁵² Recently, these same manufacturers, in an effort to update their equipment to meet the changing technology that scanners require, have designed scales which print UPC labels, as well

as standard labels. The most prominent arrangement is to affix a UPC symbol to the bottom of the meat package, while the standard label with price, weight and unit cost is affixed to the top. These special UPC symbols contain the price of the item embedded into the code, as well as a special code that represents the cut of meat being sold. These meat codes can later be retrieved and reproduced in the form of management reports which encourages improved inventory control.⁵³

The cost of these machines varies considerably depending upon the manufacturer and the quality of machine purchased. One particular manufacturer, Hobart Corporation, has been equipping various commissaries with meat-wrapping equipment for several years. The commissary at Fort Ord, the focal point of this analysis, utilizes Hobart equipment. Since the equipment may be purchased in sections, it is possible to upgrade by replacing only a portion of the system without incurring the cost of an entirely new unit. Hobart offers a scale and printer unit which does produce UPC symbols; however, since this portion of the system is a single unit, this section of equipment must be totally replaced. The cost of replacement for each unit per GSA price would total \$10,062, which includes installation. This equipment is modular by design, versatile, and can be moved during cleaning; therefore, no site preparation costs are necessary. Maintenance costs would be covered by a

service contract similar to the one presently in force on the current equipment. No exact maintenance cost figure was available from Hobart, however, due to the solid state electronics and the previous experience of other users, the scales and printers are considered the most reliable portion of the overall system.⁵⁴

A cost-benefit analysis similar to that conducted on the basic scanner equipment contained in Chapter III, will follow. A trial period after installation of the basic scanner units should take place to ensure reliability and overall acceptance before undertaking the expense of venturing into the area of scannable meats. The volume of business at Fort Ord necessitates that two wrap/weigh machines be used in the meat department. The total cost of upgrading these machines to the UPC labeler configuration would require a total investment of \$20,124 (\$10,062 x 2). No adjustment or additions to the scanner equipment previously installed and in operation would be required.

As stated earlier in Chapter III, a possible savings of between .2 percent and one percent could be generated from the installation of scanning equipment due to the increase in accuracy.⁵⁵ This same justification used in Chapter III can be applied to meat sales in order to compute the expected savings. Since the above described units will compliment previously installed scanner equipment, the savings generated from the added ability to scan meats would

mirror the initial savings realized when scanners were first introduced. For a less detailed analysis, the industry average savings of .4 percent was used in conjunction with a conservative sales figure of \$26 million. In addition, since meat represents only 24 percent of total sales, the yearly sales figure above must be first adjusted before any savings can be computed.⁵⁶

<u>Sales</u>	x	<u>Meat Percentage of Sales</u>	=	<u>Meat Sales</u>
\$26,000,000		.24		\$6,240,000
Savings as a percentage of meat sales			=	.4 Percent
Total Savings before discounting			=	\$ 24,960 ⁵⁷

In the above savings analysis, a discount factor was not used in computing the present value of the savings. It is nebulous to assume that Fort Ord or any commissary would invest in upgradable meat-wrapping equipment while scanners are being first introduced at the checkout stands.

To summarize the previous analysis, the additional equipment necessary to permit all meats to be UPC scanned during checkout, would require a one-time cost of \$20,124, as compared to an estimated yearly savings of \$24,960. It would, therefore, be advantageous to ultimately possess the capability of producing UPC symbols for meat products sold.

2. Price Removal

With scanner equipped checkout stands, it is not necessary to price mark each sale item. As previously explained, the price is retrieved from the automated processor and fed to the ECR when each item is scanned. Also,

it was previously mentioned that commercial supermarkets were subjected to considerable criticism when they attempted to remove prices from their sale items. Consumer groups charged that with price removal, grocers would secretly raise prices via the processor; plus, if products were not price marked, previous purchases could not be used as a reference for comparison shopping.⁵⁸ Laws in several states were instituted which specifically required grocery stores to individually mark each item with a unit price. Consumer resistance to the absence of unit prices has subsided in recent years as fears for unwarranted price increases have subsided. In states where unit prices were allowed to be removed with the advent of scanners, consumer complaints dwindled after the customers were presented with a detailed receipt. Because of the ten-digit UPC, sales receipts were much more detailed and contained such information as an alphabetic item description, as well as the size and price. Sales receipts from conventional checkout systems can only provide information such as department and price. Even the more elaborate electronic checkout systems which possess the capability for coding a limited number of fast-moving items, can only provide a description of those coded items. Customers are now finding that a detailed sales receipt, provided by the scanner system, is more valuable for comparison shopping than price marked products, and is easily stored

for future use. These receipts have also proved their worth by also providing the ability to check for price increases or decreases on items purchased weeks or months ago.⁵⁹

Commissaries operated by the Armed Services are not bound by the grocery laws in the state within which they operate. The Navy has, for the past several years, eliminated unit pricing in their scanner equipped commissaries. Patron acceptance of the Navy venture into price removal was an overwhelming success.⁶⁰

By eliminating the restriction of pricing each item offered for sale, the Navy, as well as commercial grocers, have realized substantial savings in the area of personnel costs. Because the cost of personnel is funded through appropriations and considering the recent attempts to reduce these appropriations, severe restrictions on the commissary civilian work force have been instituted. Civilian strength ceilings have been initiated and are currently in effect in all commissaries. These restrictive ceilings, while attempting to ration the appropriated funds, are having a severe impact on the quality of service which the commissaries offer. Commercial supermarkets boast of reduced labor costs after installing scanners; commissaries, on the other hand, could utilize such labor savings to redistribute the work force in an effort to improve service to their patrons.

In the area of price removal, several benefits would result as a consequence of such a policy. The current commissary operating instructions require price changes on items must be effected within 48 hours after the receipt of inventory bearing a price change.⁶¹ This regulation requires that all identical items of inventory must be marked with the new price -- including the shelf items currently on display in the sales area. Products in the sales area, must be either remarked with the new price while on the shelf or be transferred to the stockroom where the price transformation can be effected.

This policy is a logical requirement as prices are subject to frequent fluctuations. Obviously, products bearing the lesser price would sell first. In the case of a price decrease, older inventory items would be the last to sell, leaving products, in some cases, subject to spoilage. Price reductions are not uncommon since commissary prices are based upon cost plus transportation; therefore, prices fluctuate with almost every delivery.

If the prices are not marked on each item, considerable time, effort and expense of moving and remarking previously marked items can be eliminated. The 48-hour price change policy could easily be adhered to as item price changes could be effected at any time by way of an input device connected with the UPC scanner processor.

Prices on any merchandise delivered could be adjusted to reflect the current invoice price on a daily basis as goods are received.

Another related benefit derived from price removal would be fewer stockouts. The commissary under review at Fort Ord, attempts to maintain a two-week supply of all inventory items to preclude excessive stockouts. Quite often, empty shelves are not due to an out-of-stock item, but to the lack of personnel resources to remove the stock from storage, price it and replenish the shelves. The time savings from the elimination of item pricing would free warehouse personnel to restock depleted shelves. Another problem hampering restocking, is the congestion caused by overcrowding which will be discussed Section B, Item 3 of this chapter.

The final area where redistribution of personnel would have its greatest impact, is the checkout area. Because of personnel shortages, as well as other related problems, it is not uncommon for several of the checkout lanes to be closed even on the busiest days. These closures are directly attributed to the lack of qualified cashiers to man these stations. The resulting impeded checkout process detracts from the overall service provided, not to mention fostering a discontentedness among the patrons. With the labor savings offered by price removal, more personnel would be available to man the checkout stands.

3. Inventory Management

All four of the military service commissary systems are currently concerned over the apparent lack of control over their store inventories. There are two basic methods of obtaining inventory: centralized complexing or relying upon independent wholesale distributors. Whether, a commissary operates in a complexing environment or must rely upon independent wholesale distributors to obtain its merchandise inventory, a UPC scanner system can provide improved inventory control, as well as various other management reports not previously available through any other source.

One attempt to improve inventory control was the inception of a centralized commissary complexing operation. Complexing involves the military ownership and operation of a centralized warehouse which acts as the focal point for the inventory distribution system servicing two or more commissary stores. There are several advantages to complexing; one being a reduction in the total amount of store-room inventory. A centralized warehouse maintains the bulk of the inventory until needed items are ordered by and shipped to individual commissaries. Due to this centralized system, the overall inventory needs of participating stores are reduced and subsequently, less Commissary Trust Fund dollars are committed to individual store inventories. In addition, tighter inventory control is maintained; because,

instead of each store maintaining and protecting its own inventory, a central location affords increased security. Depending upon the mileage distance between the warehouse and individual commissary, and the order processing and delivery time, most stores maintain several days supply of fast-moving items in their own storeroom. Slower moving items have no storeroom replacements. Because of the absence of vast amounts of grocery items stocked on the premises of each store, an accurate, as well as frequent inventory must be taken to preclude stockouts.⁶²

Operating in a complexing environment also allows for the lowest merchandise prices to be obtained since economic lot sizes, procured at the most advantageous price, can be purchased and stored in the additional storage space afforded by a centralized warehouse. Normally, these economic lots are too large for any one commissary to handle.

The Marine Corps, to date, is the only service which has been able to adapt its commissary operation entirely to a complexing system. The remaining services have only been able to make limited complexing applications, due to the geographical dispersed bases and stations where commissaries are located, and therefore, could never economically justify such a network. As truck transportation costs continue to increase, some stores may find that the lower costs initially offered by complexing may no longer exist.

The commissary stores that are not in a position to participate in a complexing system, must rely on privately owned and operated warehouses located near their facility. Commissaries in the above position must depend upon two primary types of distributors: direct store deliveries (DSD) and wholesale distributors. The commissary under review, employs both types of distributors to fulfill their inventory needs.

DSD personnel actually enter the sales area to restock shelves or displays with their products. Examples of DSD items are dairy products, soft drinks, bakery products and impulse items located near each checkout stand. Wholesale distributors deliver merchandise to the storeroom section of the store, where it is inventoried upon receipt.⁶³ Normally, several wholesale distributors are needed to provide a full line of grocery items. These distributors are contracted to maintain a storeroom inventory of each item, thus precluding stockouts. Furthermore, the distributors employ their own personnel to frequently visit the stores and prepare an order based on estimated needs and remaining inventory. In the event a stockout has occurred or is imminent, store personnel are instructed to inform the appropriate supervisor so that an internally generated order can be submitted. One drawback from having the distributors prepare orders, is that commissary storerooms

are often over-stocked with slow moving items. In addition, these storerooms also become a haven for the distributors to store merchandise which they have procured but have no room to store.

Complexing systems are designed to replace the wholesale distributor; but, even the most well-stocked central warehouse is not designed to eliminate direct store deliveries. Complexing systems were instituted to improve inventory control by substantially reducing the inventory housed at each store by securing these inventories at a central warehouse.

A panacea for micro-managing inventory, would be an automated, perpetual inventory system which would permit continuous updating of inventory balances when goods are received and decrementing this balance when goods are sold. Several manufacturers are experimenting with such a perpetual inventory system designed for grocery stores, but the practical application of such a system is at best several years hence. The main problem to be overcome in the operation of a perpetual system, is the method of inputting deliveries into the system program. The only method yet devised is through manual entry which is time consuming and costly.⁶⁴

The UPC scanner system offers a vast improvement over the current manual inventory reporting procedures.

Even though a perpetual system is not available at present, the processor, the heart of the scanner system, records and retains item sales on a continuous basis. These sales are grouped by Universal Product Code and can be displayed in report format by using an inexpensive printing device. This information can be used to institute a simple replenishment strategy. This type of strategy simply involves ordering to replace what is sold. This process would reduce unnecessary distributor sales traffic within the storeroom area, thus placing the inventory under store management's control vice distributor control. In this way, excessive costs of purchasing and holding unnecessarily large inventories could also be reduced.⁶⁵

The present UPC system design also permits a myriad of management reports. These reports are programmed into the computer logic of the processor when scanners are installed. NCR equips each new scanner installation with a software program which permits retrieval of sales data in several formats. These reports permit a detailed analysis of the total sales by day, week or month, grouped by UPC. These reports can also be produced by product group, departmental or storewide basis in an effort to control "unexplained loss" or shrinkage.⁶⁶

In a well documented case, a grocer explained that the greater understanding of item movement and merchandising needs, provided by these reports, resulted in several items

being dropped because the UPC data indicated that more movement stemmed from theft than from sales.⁶⁷

Commissaries are often thought to be more secure because of their location aboard a military installation. The manager at Fort Ord estimates that the problem of pilferage from the commissary is at least as serious as that experienced by their commercial counterparts. The threat of losing one's commissary privileges if caught shoplifting, evidently has not proven an adequate deterrent. The understaffed and overcrowded condition in which commissaries usually operate make it relatively easy to escape detection from such practices. The item movement reports available with a scanner installation are invaluable in exposing the magnitude of the pilferage problem on a timely basis enabling both department and store managers to evaluate and initiate corrective action.

Physical inventories are currently conducted on a quarterly basis. The beginning inventory, plus goods received is reduced by the end-of-period inventory to obtain the cost of goods sold. Because detailed sales information is not supplied by the current checkout system, it is not possible to ascertain the exact products comprising the pilferage. With the data available after the installation of a UPC scanner system, inventory reports on a weekly or other periodic basis, could be produced locally

for analysis. Store managers, as well as department managers could use these reports to pinpoint items which experience an inordinate amount of shrinkage. The item shrinkage could be corrected by moving those specific items to a location where more control is present or in extreme circumstances, eliminating that particular item from the inventory.

Commissaries are required to stock various types of grocery items which ethnic and minority groups are accustomed to using. Commercial supermarkets have experienced considerable success catering to the desires of their local clientele. The military is representative of a cross section of Americans, as well as many other nationalities. Commissaries must, therefore, carry an even greater assortment of foods than their commercial counterparts. The management reports generated from a scanner system would be invaluable in adjusting product demand, as well as shelf space allocation.⁶⁸

4. Personnel Training

The commissary at Fort Ord employs GS-3 rated employees as cashiers. Because of the low rating of this position, the commissary has difficulty attracting, motivating and retaining qualified individuals. Commissary management believe that many cashiers use the training and experience offered by employment at the commissary as a stepping stone to a more lucrative cashier position in a commercial supermarket. Whatever the reason for the high

turnover, the fact remains that the commissary will be saddled with the responsibility of training new employees.

Since cashiers, both full and part-time employees, make up a large portion of the work force, considerable time and effort is involved in their training. The training time for a cashier to become proficient using the present ECR is estimated to be two weeks. Most of the two-week training period is consumed learning the correct department key to be used with the items being "rung-up", as well as a familiarization of the 200 coded items which are input via a code instead of a price. In that only five percent of the commissary items do not have UPC's, training a new cashier can be accomplished much quicker. To operate the scanner, the only knowledge required is to position the UPC code in such a manner that the scanner can read it. UPC's can be slipped over the scanner sideways, backwards or even upside down without affecting the scanner accuracy or speed. Since the 200 coded items would be eliminated by the scanner, only a single specific code key need be entered before entering the price via the keyboard for non-UPC marked items. The present cashier training time could possibly be reduced by more than one-half with scanner equipped checkout stands.⁶⁹

B. SOFT BENEFITS

Scanners were developed primarily as a grocery store management device concerned principally with reducing costs. It was only after scanners were installed, that several non-quantifiable customer benefits were evident. These soft benefits will be enumerated in this section.

1. More Detailed and Descriptive Sales Receipt

The price look-up system incorporated into all scanner systems allows for a more informative sales receipt. During checkout, each UPC is read as fast as the item is passed over the scanner. This information is transmitted instantaneously via the ECR to the processor where the product code is matched to its unique file. The information on file within the processor is again electronically transferred back to the ECR where the price is displayed and an alphabetic description, along with the unit price is printed on the sales receipt. These sales receipts provide the information in a convenient readable format which can later be used to check the customer's purchases, compare item prices, or be used to prepare a future shopping list.

2. Better Selection of Merchandise

For the commissary customer it is extremely discouraging to find out-of-stock items which requires either a return trip to the commissary or a trip to a commercial supermarket. Many times when the primary item is sold out,

backups in another brand usually cannot sustain the additional sales and that item too is soon depleted. Not only is the out-of-stock situation discouraging for the customer, it also creates serious inventory control problems and costs for management and the consumer. With a scanner system, each item is identified when sold and this information retained in the processor for eventual preparation of management reports. With these reports, commissary managers are able to better control inventory ordering. Commissaries could also make adjustments in grocery product mix, as well as shelf space allocation in order to improve merchandise selection. With improved capability of monitoring item movement and the increased inventory control that would result, fewer stockouts could be expected.

3. Reduced Checkout Time

Commercial stores that are scanner equipped have noted increased checkout speed. The speed increase is attributable to two areas. Cashiers proficient on the previous ECR equipment improve their speed slightly, while mediocre cashiers experience a quantum jump in speed to where they are as fast as the previously more proficient cashiers. Because the items are merely slipped over the scanner area instead of being keypunched into the ECR, greater speed is possible. Currently, the normal practice for customers is to unload their basket and place the items

on the checkout stand in such a way that the price of each item is clearly visible. In scanner equipped stores, customers need only be concerned that the UPC label, normally on the side or bottom of an item, is placed in such a manner that the cashier can slip the UPC portion of the item package over the scanner window. Improvements in the scanners reading ability now allow cashiers to use two hands and continuously pass items swiftly over the scanner window. A built-in safeguard system emits instantaneous audible beeps as each UPC is correctly "read".

Because of the fixed design of the commissary, increasing the number of checkout stands could be accomplished only through construction. Enlarging the frontage area where patrons await their turn to check out, would reduce the commissary effectiveness by reducing valuable shelf space. The commissary stocks 7,800 pure food items which is modest compared to an equivalent sized commercial supermarket that stocks over 12,000 pure food items in the same area.⁷⁰ Therefore, the only conceivable way to increase throughput at the checkout area would involve increasing the speed at check out.

Because UPC scanners accelerate the average speed of checking out, these devices would not only reduce the time spent waiting in line, but eliminate or reduce the possibility that the length of the waiting line would exceed the designated waiting area and thus, congest the

grocery isles. Excessive waiting lines are not only an irritant to the patrons, but frustrate the effects of employees in restocking depleted shelf items.

Scanning takes all of the guesswork out of pricing at the checkout stand. There is no misreading of prices, no waiting for price checks of unmarked items, and no searching for codes. Since most of the mental and manual operations are eliminated, cashiers are less fatigued, and can give more attention to being the store's goodwill ambassadors.

In summary, this chapter has described the additional hard and soft benefits that can be realized after the installation of a scanner system. Cost savings generated by scanning meats, removing prices, reducing personnel training time and improving inventory control have a positive impact on the service provided to the patrons. The soft benefits described are specific beneficial areas where commissary patrons would be most directly affected by the scanner system.

V. CONCLUSION

The current debate concerning appropriated fund support for military commissaries is a contemporary topic of interest, within as well as outside the military community. A recent GAO Report, critical of the current commissary system, recommended that all metropolitan commissaries be closed. The military retort to this recommendation was that not only do the Armed Services have a moral commitment to provide this benefit, but that commissaries have proved to be a substantial inducement for recruiting and retention.

Commissaries were initially instituted to sell subsistence items at cost to authorized personnel located in isolated areas. The overall responsibility for operating such stores was vested in the individual base or station commander's hands. When an attempt was made to reorganize the structure of the commissary system by consolidating these fragmented stores into four centrally managed organizations, the move was opposed by those commanders. They believed that the commissary stores aboard their installation were primary factors influencing the morale and welfare of their command and, therefore, should be under their jurisdiction. These commanders perceived that a centrally managed system would be irresponsive to any necessary changes or improvements in the operation of their individual commissary possibly creating

a detrimental effect upon the morale and welfare of their command. This obstacle was eventually overcome and the existing commissaries were segregated and grouped by service. Now these separate service commissary systems are being urged to consolidate into one single DOD centrally-managed system.

Commissaries today are a very large commercial-type food outlet with worldwide annual sales of over \$3 billion.⁷¹ In order to operate under the current system a substantial portion of the Defense appropriation, in the form of Operation and Maintenance funds, is required. Various studies have been conducted to analyze the commissary operating structure with hopes of reducing this appropriated support. The approach that these study groups employed and the resulting recommended solutions were based primarily on a macro approach to efficient commissary operation. This thesis, on the other hand, took a micro approach. This overall analysis was directed toward improving the operating efficiency of one store creating the option to apply the basic solutions to other commissaries experiencing common problems. The commissary at Fort Ord, California was used as the model and all financial, as well as operating characteristics of that store were used in this analysis.

The research conducted indicates that a considerable savings, both monetary and manpower, as well as an overall improvement in patron service, would be evident after

installing a UPC scanner system at this commissary. Actual equipment prices and specifications introduced in this thesis are not presented as the best or only possible alternatives. With the exception of the scanner equipment, which can be readily and inexpensively connected to existing equipment, a considerable variety exists in the area of ancillary equipment including manufacturers, quality and price.

Various economies of scale are an inherent benefit from most quantity equipment purchases. The UPC scanners necessary for the conversion from an ECR system to a fully automated scanner price look-up system is no exception. Unfortunately, when upgrading to a scanner system, where customer acceptance, as well as management understanding is essential, diseconomies may overshadow the benefit of a quantity purchase.

A recommended course for implementation involves a well-planned attack with sufficient management involvement and understanding, as well as customer liaison. Implementation should initially be on a limited basis to ensure that each service acquires sufficient experience with the basic system before a full implementation schedule is devised. Not only should local management and commissary patrons receive first-hand experience with these scanners, but during this initial installation period, the scanners should be tested and re-evaluated insofar as their reliability and compatibility with the present equipment. Specific attention should also

be directed toward revising or modifying the software provided to comply with specific commissary management's needs and desires. During the actual testing environment, an inexpensive printing device should be procured to provide a limited amount of management reports.

As implementation progresses, a centralized report capability should be established. The processor provides an inherent ability to record sales transaction data on a cassette tape. These cassettes could be periodically transmitted via the telephone to a centralized or Regional Commissary Headquarters where the actual processing and printing of the data would be accomplished. The above mentioned printing devices should be maintained to provide exclusive store data needs, whereas the Regional Commissary Headquarters should establish standardized report formats to conform to the overall management needs of the commissaries.

These Regional Headquarters could economically justify the necessary computer capability to process the raw sales data from each store into reports and summaries in compliance with each service's report requirements, as well as those of the Department of Defense as a whole.

In summary, while commercial supermarkets were experimenting with technologically automated grocery sales equipment to reduce their costs and improve profits, commissaries were relying upon increased appropriated funds. In an effort to economize, the services have recently been directed to

consolidate their fragmented stores into four centrally managed systems. The services have in turn, instituted complexing, where feasible, to further improve control and reduce costs.

Further cost savings, as well as improved customer service, could be attained by adapting the commercial supermarkets tried and tested system, the UPC scanner. These scanners are not only an attractive investment from a strictly monetary standpoint, but are an extremely flexible system which can be enhanced by a myriad of peripheral, as well as ancillary equipment. These devices have not only proven themselves in the commercial sector as cost saving devices, but have provided numerous nonquantifiable patron benefits.

The prospect of forcing the commissaries into operating on a self-sufficient basis, has been postulated by Congress for years. This is an appropriate time to seriously consider improving commissary operations through technological innovations so that these military institutions will be preserved in the event that appropriated support is reduced or removed.

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