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THESIS

CHANGES NEEDED IN DOD'S INCENTIVE AND REWARD STRUCTURE TO AFFECT INVENTORY REDUCTIONS IN DOD INVENTORY LEVELS

by

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December, 1996

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In its report titled "Organizational Culture: Use of Training to Help Change DOD Inventory Management Culture," (GAO/NSIAD-94-193) (1994), the Government Accounting Office asserts that the Department of Defense would be able to reduce its inventory of secondary items and develop a culture of economic and efficient inventory management if Department of Defense inventory management personnel were trained in modern logistics practices. In contrast, this thesis presents the position that high inventory levels are the result of performance measures and reward systems that encourage holding high levels of inventory. Included is a description of performance measures used for Item Managers, Inventory Managers and unit commanders as well as a discussion of an employee motivation model, and other systemic factors that impact inventory levels. This thesis suggests the addition of Inventory Turnover and Total Costing to the performance appraisals of those within the Department of Defense's supply systems, and a separation of readiness criteria into supply-related and non-supply-related issues for unit commanders' performance appraisals as means to promote lower on-hand secondary inventories while continuing to meet the demand for those items.

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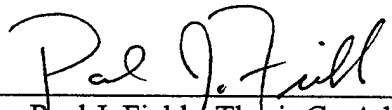
Approved by: 
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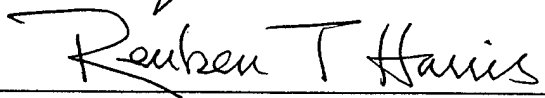
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ABSTRACT

In its report titled "Organizational Culture: Use of Training to Help Change DOD Inventory Management Culture," (GAO/NSIAD-94-193) (1994), the Government Accounting Office asserts that the Department of Defense would be able to reduce its inventory of secondary items and develop a culture of economic and efficient inventory management if Department of Defense inventory management personnel were trained in modern logistics practices. In contrast, this thesis presents the position that high inventory levels are the result of performance measures and reward systems that encourage holding high levels of inventory. Included is a description of performance measures used for Item Managers, Inventory Managers and unit commanders along with a discussion of an employee motivation model and other systemic factors that impact inventory levels. This thesis suggests the addition of Inventory Turnover and Total Costing to the performance appraisals of those within the Department of Defense's supply systems, and a separation of readiness criteria into supply-related and non-supply-related issues for unit commanders' performance appraisals as means to promote lower on-hand secondary inventories while continuing to meet the demand for those items.

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I. INTRODUCTION

A. BACKGROUND

Over the past twenty years, there has been a revolution in inventory management practices in the private sector. A shift in the way businesses view inventory and its relationship to firm profitability has birthed a new set of performance measures and rewards focused on inventory reduction. Some results of this paradigm shift are: drastically reduced on-hand inventories, improved distribution systems, higher quality products and services, and healthier bottom lines for businesses who successfully make the shift. Meanwhile, military inventory management practices have remained largely the same.

The Department of Defense (DoD) is in an era of continuous budget reductions. As the largest single portion of the discretionary federal budget, DoD is a prime target for budget cuts. Procurement scandals in the media exacerbated the situation and have placed DoD under a public and media microscope, resulting in Congressional inquiries and United States General Accounting Office (GAO) audits. Some of these have identified excess inventory within the military as a significant problem. However, over the last ten years the Department of Defense has been moving slowly toward a more efficient inventory management system. Why has DoD lagged behind the commercial sector in this area? There are many reasons and most of them are interrelated, making any change a lengthy and complex undertaking. A GAO report titled "Organizational

Culture: Use of Training to Help Change DOD Inventory Management Culture," (GAO/NSIAD-94-193), dated August, 1994, asserts that DoD's training in modern logistics practices is lacking and that, once accomplished, DoD's Inventory and Item Managers will have the tools they need to bring DoD up to par with commercial businesses. This report states that training in modern logistics practices will "foster the desired change" in the current culture (GAO/NSIAD-94-193; pp. 2-3).

In the author's opinion the GAO's assertion that training in modern logistics practices will reduce excess inventory is only partially correct. Standardized training in modern logistics practices for all supply and logistics personnel, exposing them to just-in-time inventory methods, direct vendor delivery, total asset visibility concepts and sophisticated economic order quantity models would be beneficial. However, training alone will not reduce inventory levels. High inventory levels are the result of performance measures and a reward system that values holding these high levels of inventory. There are other systemic features which also can have significant impacts on inventory management practices, however, this thesis does not address these in depth. An analysis of the behaviors of managers within DoD's inventory system and the performance measures and rewards that propagate these behaviors can explain to a greater degree why the military has not kept pace with the private sector in inventory reduction.

B. SCOPE OF THESIS

The scope of this thesis is limited to the management of secondary items, an inventory category comprised of repair parts, replacement parts, clothing, subsistence items, medical supplies, and consumables such as fuel.

First, this thesis provides a simple overview of DoD's supply systems, then looks at its current performance measures and rewards systems in order to identify those aspects of these systems that promote carrying inventory in excess of demand. This thesis then discusses a model of employee performance and develops performance measures which may have the greatest impact in lowering inventory levels in DoD.

C. RESEARCH QUESTIONS

This thesis attempts to answer the question "What areas within the current DoD performance measure and reward structure need to change, and how, in order to accomplish inventory reductions?" In order to effectively answer this question, other questions must first be answered. First, how are Item and Inventory Managers' performance currently measured and rewarded? Next, do the current performance criteria and reward systems impact inventory levels? And if so, do they explain high levels of DoD inventory, and if so, what must performance measures be in order to motivate behaviors that result in inventory reductions? Then, what are the impediments

which keep these changes from occurring? The final question to be addressed is, given the above information, How can these changes be implemented within DoD?

D. RESEARCH METHODS

Information for this thesis was obtained from several sources. The information used to benchmark DoD's current performance measures and rewards systems was obtained through on-site semi-structured interviews with:

1) Office of the Joint Staff (J4) (Logistics) and key staff members, Pentagon, Washington, DC;

2) Chief, Supply Procedures and System Modernization, Air Combat Logistics Command, Langley Air Force Base, Virginia;

3) Two Item Managers, two Supply Systems Analysts, the Chief of the Weapons Systems Division, Deputy Chief-of-Staff (Combat Development), and two members of the Comptroller's department at Defense General Supply Center, Richmond, Virginia;

4) Five Inventory Managers at US Army Training and Doctrine Command, Ft. Monroe, Virginia, Marine Corps Base, Quantico, Virginia, and Defense Depot, Norfolk, Virginia.

The basic questions asked during the interviews are listed in the Appendix. Additional questions were asked where needed to clarify responses. Further information was obtained through unstructured discussions with five Army, Navy and Marine Corps supply officers assigned for duty at Naval Postgraduate School, Monterey, California. Several GAO reports pertaining to inventory management also were reviewed for applicability.

E. ORGANIZATION

There are five remaining chapters. Chapter II describes the administrative flow of the federal supply system, discusses the performance measures used for Item and Inventory Managers, and the behavioral impact of these measures on DoD inventory. Chapter III describes a model of employee motivation examining how motivation, performance measures and organizational goals are inextricably linked. Chapter III also suggests additional performance measures which could result in behaviors that reduce inventory levels. Chapter IV discuses factors internal and external to DoD that impede change. Chapter V looks at ways of implementing different performance measures and rewards while taking into account the limitations identified in Chapter IV. Chapter VI contains a summary of the thesis and conclusions.

II. PERFORMANCE MEASURES AND THEIR IMPACT ON DOD INVENTORY

The supply system currently in use in DoD evolved over many years and is designed to support high levels of combat readiness. The performance criteria against which personnel in the supply system are measured have not changed to reflect the recent emphasis on efficiency through lower operating costs and less capital investment in inventory.

This chapter first provides an overview of the inventory and supply systems used in DoD, including the Defense Logistics Agency, General Services Administration and each of the four branches of the Armed Forces. Following this is a discussion of the performance criteria against which Item Managers, Inventory Managers and unit Commanding Officers, or "users," are measured. This chapter is intended to serve as a benchmark from which to improve the way performance is measured with the goal of increasing the efficiency with which the supply system operates.

A. THE WHOLESALE AND RETAIL SUPPLY CONCEPT

Just as the private sector supply system is divided into retail and wholesale levels, so too is the DoD supply system. Although the specific supply system used by each branch of the Armed Forces is constructed differently, the Army, Navy and Marine Corps use both wholesale and retail stock points. The Air Force uses only wholesale. The federal government's wholesale stock system is comprised of five organizations: the

General Services Administration, the Defense Logistics Agency, and the service - specific wholesale stock points managed by the Army, Navy and Air Force, respectively.

Item Managers are located at wholesale-level activities. An Item Manager is assigned for each and every National Stock Number (NSN) item that a wholesale activity controls. Item Managers are typically assigned the control of many different items. The Item Manager is responsible for procuring the item, selecting the stocking location, tracking the item's demand history, and arranging transportation of the item from the depot to the user. They also are encouraged to arrange for direct vendor delivery whenever possible in order to reduce warehousing costs to the government. An individual Item Manager may be responsible for a few highly complex items or many simpler items. (Nixon and Wolfe, 1996)

Inventory Managers are located at retail-level activities. An Inventory Manager is responsible for managing all materials stored in a facility, regardless of the NSN, much the same as occurs in a civilian retail store. High demand items are located at the retail level as well as at the wholesale level to support the needs of the user.

B. SUPPLY SYSTEMS

1. Defense Logistics Agency

The Defense Logistics Agency (DLA) is the DoD wholesale distributor for logistics materials used in common by the service branches (Smith, 1996).

There are nine categories of items that DLA does not control:

1) Major end items (e.g., ships, aircraft, tanks, etc.);

2) Depot level repairable parts;

3) Items which are used exclusively by one service branch;

4) Non-ordinance nuclear items;

5) Items that have been waivered;

6) Reclaimed by a service;

7) Weapons systems being held for foreign military sales;

8) Weapons systems program items which are not design stable or are in pre-production testing; and

9) Modification/alteration kits for a current weapons system.

Logistics items (such as tools, general repair parts, sub-assemblies, etc.) not meeting one or more of these criteria are controlled by DLA.

DLA is organized in three tiers located across the country:

1) Headquarters in Ft. Belvoir, Virginia;

2) Defense General Supply Centers (where the Item Managers are located); and

3) Defense Distribution Centers (where the stock is actually held).

DLA is a Defense Business Operating Fund activity, meaning that it does not receive annual appropriations from Congress, but adds a surcharge to the cost of the items sold. The purpose of the surcharge is to just cover DLA's general, administration and operating costs each year.

2. General Services Administration

The General Services Administration (GSA) serves as a wholesale supplier to all federal agencies, including DoD. GSA is fully self-supporting and offers such commodities as general office supplies (from pens and pencils to large furniture items), leased space for government and DoD offices, as well as leases for many types of industrial and non-industrial vehicles and tools. GSA does not handle logistics items, so there is minimal overlap with DLA inventories.

3. U.S. Army

The Army separates its equipment and related items into nine classifications. The unit or command relying on the supply system for secondary item support (i.e., combat units) is referred to as the "User" in Figure 2.1 and subsequent figures. The user must determine if the item to be procured is in the national stock system (it has an NSN). If so, the user requests the material required from the Army retail activity responsible for the item. If not, then the user obtains permission to order the item through a commercial vendor.

The arrows in Figure 2.1 and subsequent figures in this chapter represent the administrative path of item requisitions. The physical flow of the item is the reverse, unless otherwise specified. As shown in Figure 2.1, for items that are repairable, the user places his requisition with the Direct Support/General Service Maintenance Activity (DS/GS), turning in the broken part at the same time. For all other classes of material

except medical supplies, the user's requisition goes to the Material Management Center (MMC) to be filled. The MMC fills the request from stock on hand or orders the item from the appropriate wholesale activity.

The DS/GS also orders through the MMC to replenish their stock of repair parts. The wholesale activities used by the Army are GSA, DLA and the Army Material Command. The Army Material Command manages those Army-specific items identified as not DLA controlled. (Steiner, 1996)

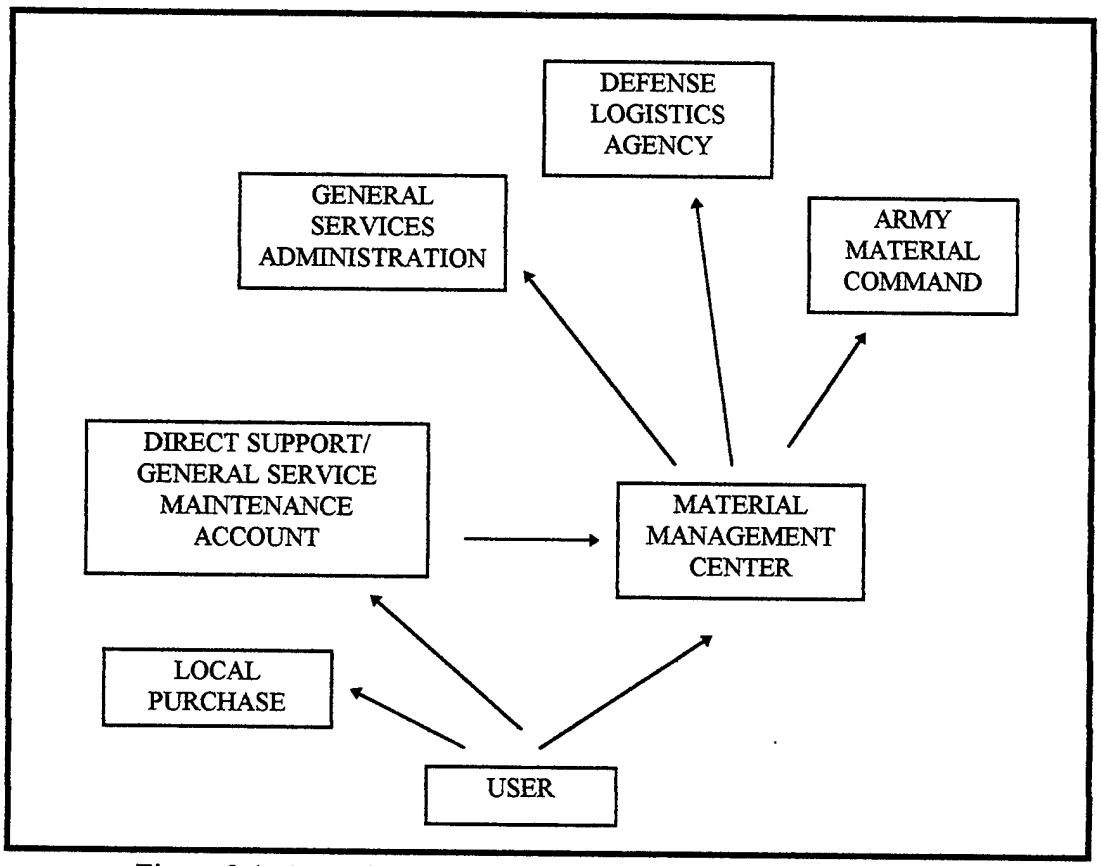

Figure 2.1 Army Supply System's Administrative Item Requisition Path

4. U.S. Navy

The Navy separates its materials into "cognizance codes" based upon the wholesale activity that controls the item. Local purchases are authorized only when an NSN item does not exist or is not available to fill the request in time for deployment. After determining that the desired item is in the NSN system, the user places the requisition with the local Supply Response Section (SRS) at the ship or Naval Station level. The SRS holds some stock of high demand items and fills the requisition from stock on hand if it is available. If the stock is not available, the requisition is forwarded to the Document Control Unit (DCU). The DCU is an expediting activity only and holds no stock. The DCU determines which wholesale activity controls the requested item and places the order with that activity, as depicted in Figure 2.2. The SRS and DCU are both part of the user activity's supply department.

If the user is deployed, the DCU sends the requisition to the Retail Stock section of the tender or aircraft carrier's (when part of a battlegroup) supply department to be filled. If the user is not deployed, the request goes to the Fleet Industrial Support Center (FISC) to be filled. The FISC is a warehouse holding inventory belonging to DLA and the Navy Inventory Control Point (NAVICP), signified by the arrows from these two organizations to the FISC. The NAVICP manages the Navy-specific items identified as not under DLA's control. (Park, 1996; Randle, 1996)

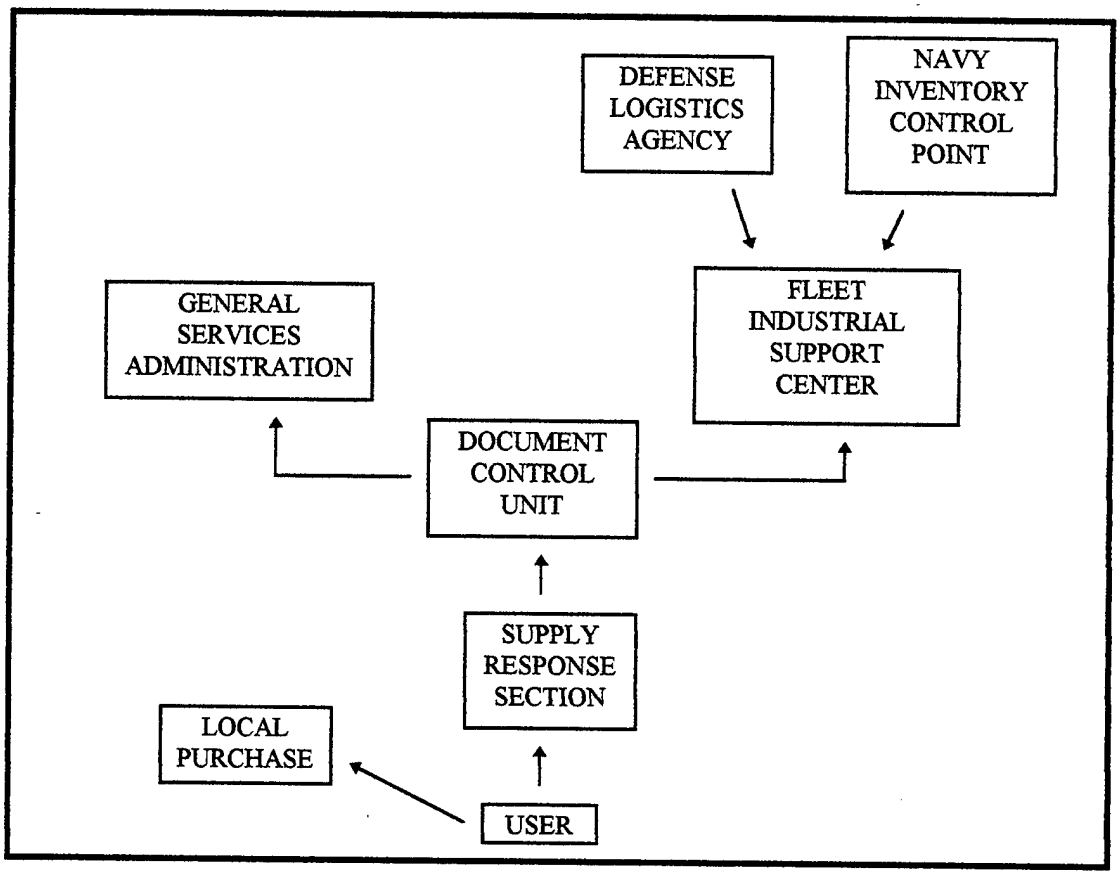

Figure 2.2 Navy Supply System's Administrative Item Requisition Path

5. U.S. Air Force

The Air Force no longer uses a retail level of supply, as shown in Figure 2.3. The user is required to do all the research necessary to locate the desired item within the NSN system. If an appropriate NSN does not exist, a local purchase is authorized for the item. Otherwise the user forwards the requisition directly to the wholesale level who controls that item, either DLA, GSA or an Air Logistics Center (ALC). The ALC manages those Air Force - specific items identified as not DLA controlled. (Benson, 1996)

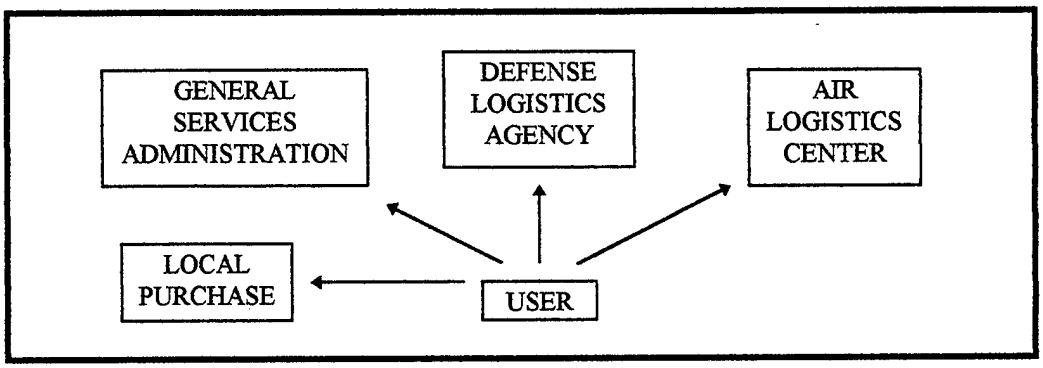

Figure 2.3 Air Force Supply System's Administrative Item Requisition Path

6. U.S. Marine Corps

The Marine Corps separates its material into three supply account codes based upon the cost of the item. Local purchases of items are authorized only when the requested item is not in the NSN system. When a needed item does hold an NSN, the user places his request with the local supply unit, as shown in Figure 2.4, which carries only minimal inexpensive, high demand items (pens, paper, light bulbs, etc.) for issue.

If base supply does not have the item, the requisition is forwarded to the Supported Activity Supply System (SASSY) Management Unit (SMU) located on the base. The SMU fills requisitions from stock on hand. If the SMU does not have the item, the request is forwarded to the appropriate wholesale activity, GSA, DLA or the Marine Corps Logistics Base (MCLB). The MCLB manages those Marine Corps - specific items identified as not under DLA's control (Brownfield and Santy, 1996).

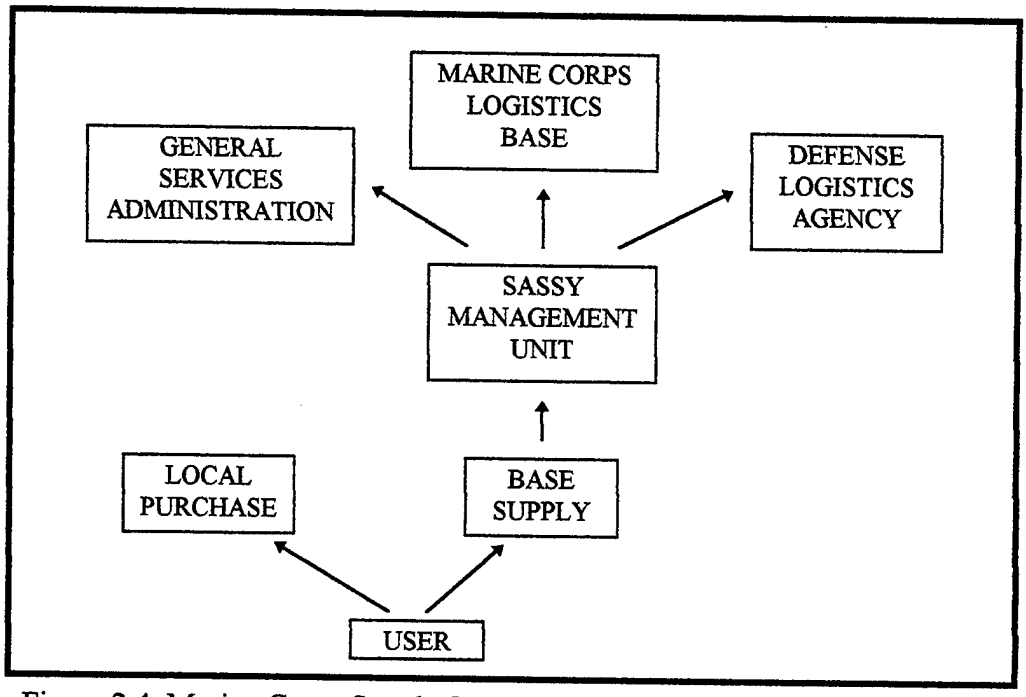

Figure 2.4 Marine Corps Supply System's Administrative Requisition Path

C. PERFORMANCE MEASURES FOR ITEM MANAGERS, INVENTORY MANAGERS AND USERS

1. Item Managers

Item Managers are located at the wholesale level of the federal supply system. GSA, DLA and each branch of the armed forces has Item Managers for the items they manage at the wholesale level.

a. Performance Measures

Item managers interviewed for this study at wholesale activities indicated the primary performance measure criterion was the Item Manager's order fill rate (Nixon and Wolfe, 1996). The order fill rate is determined simply by dividing the number of orders filled by the total number of orders received. The second most common measurement is backorder age: how long an item has been on backorder, waiting to be filled, from the time the requisition is received.

Other criteria cited include:

1) Number of orders shipped;
2) Number of pounds shipped; and a
3) Ratio of the amount of warehouse space used per item divided by that item's turnover rate.

Item Managers indicated that the order fill rate and backorder age are the most important factors for performance appraisals. The other measurement criteria mentioned are secondary elements.

b. Impact on Inventory Levels

The results of using the performance measures listed above do not contribute to lowering inventory levels. To the contrary, the order fill rate criterion promotes keeping high inventories on hand to support as high an order fill rate as possible for that Item Manager (Benson, 1996; Coulombe, 1996; Nixon and Wolfe, 1996). The high order fill rates result in high performance appraisal ratings on this

criterion for the Item Manager, possibly qualifying him or her for an annual performance award.

The second criterion, backorder age, results in Item Managers canceling an order as soon as they determine that they are unable to fill the requisition quickly. This keeps the Item Manager's backorder ages low, supporting high performance appraisal ratings for this performance criterion. Lengthy backorder ages occur most frequently as a result of lack of availability from the manufacturer and long lead times, both of which are outside the Item Managers' control (Nixon and Wolfe, 1996). The other criteria mentioned result in behaviors such as:

1) Shipping many small orders, while delaying the shipment of large orders;
2) Splitting large orders to increase the number of orders shipped; or
3) Shipping large or heavy items first, postponing small or lightweight shipments in order to increase the total pounds of material shipped.

The reason these behaviors occur is that they increase the value of the criterion being assessed, which has positive results on the Item Manager's performance appraisal. For example, an Item Manager who ships 24 small orders receives a higher performance appraisal mark for "Number of Orders Shipped" than an Item Manager who ships only 17 orders. An Item Manager who ships an air conditioning unit weighing several hundred pounds receives a higher performance appraisal mark for "Number of Pounds Shipped" than an Item Manager who ships pens and pencils weighing a few ounces.

Although the Item Managers interviewed did not indicate that the ratio of how much warehouse space an item uses divided by the item turnover rate results in any

directly attributable behavior, it can negatively affect the morale of Item Managers assigned large, low demand inventory items, because it is a performance criterion "hit" over which they have no control (Nixon and Wolfe, 1996; Benson, 1996). DLA has specifically attempted to ensure that the assignment of these items was evenly distributed – that no Item Manager was assigned a disproportionate share of this type of item (Smith, 1996).

2. Inventory Managers

Inventory Managers are located at the retail level of each service branch's supply system. Any supply activity occurring below the wholesale level is considered retail.

a. Performance Measures

The performance measures for Inventory Managers are very similar to those of Item Managers, in that the primary focus is on material availability. Order fill rates and backorder ages are the primary criteria used to evaluate supply personnel at the retail level. Inventory Managers want material at the retail stock point or quickly obtainable when a request arrives. This will enable them to keep order fill rates high and backorder ages low. (Benson, 1996; Park, 1996; Brownfield and Santy, 1996; Smith, 1996; Nixon and Wolfe, 1996)

Every military organizational element has a list of all the equipment, spare parts, clothing and food items the unit and its subordinates, including non-combat

elements, must have in order to be combat ready. Each branch of service has a different term for this list, so this thesis uses the phrase "requirements objective" (RO) for the sake of simplicity. Inventory Managers carry those items their customers require to meet their RO. At the retail level, maximum and minimum stock levels for each item carried are in place and enforced, with the exception of the Navy, which sets only minimum levels.

One resource that Inventory Managers have that is not available to Item Managers is the "backdoor supply chain." This refers to the Inventory Managers' ability to contact each other when attempting to locate a requisitioned item not in their stock at the time. This is especially true for units deploying on short notice, which are unable to wait for an order to arrive from a wholesale activity. One Inventory Manager will arrange to fill his or her RO from another Inventory Manager's stock, then redirect the material he or she has on order to replenish the stock of the Inventory Manager who helped him or her.

b. Impact on Inventory Levels

There is an incredible amount of pressure on the retail level of supply from operational unit commanders to be able to fill every requisition as soon as it arrives. The ability of the retail level to fill orders quickly has a direct impact on the readiness of combat units, the availability of the equipment the units use and the service branches' ability to support the service members. The consequences of inadequate logistics support can be significant, most notably mission failure and the loss of American lives.

This emphasis motivates Inventory Managers to carry as close to their maximum stock levels as possible of as many items as possible. There is also a great temptation to try to carry small amounts of additional inventories of those items that the Inventory Manager, and the unit commander(s) he or she serves, believes may be needed beyond the RO level.

3. Users

By "users" is meant any command or unit who relies on the supply system for secondary item support. These include staff and administrative and medical support units as well as combat units.

a. Performance Measures

Commanders of combat units are evaluated based upon their readiness for battle. Readiness for battle is determined by criteria such as:

1) Are their aircraft fully mission capable?
2) Do their troops have all required equipment?
3) Is the equipment in good condition?
4) Are the weapons' systems fully operational and mission capable?

When equipment is unavailable for service, the user wants it back in service right away. The user is inadvertently penalized when the wholesale activity is unable to procure the required part. The expectations of the user's superiors and peers is

that operational availability will be at or above what is minimally required (anywhere from 85% to 99%, depending upon the element reviewed). The user has the added pressure of being evaluated in relation to his peers' readiness levels.

b. Impact on Inventory Levels

Combat commanders have a very difficult job. Ultimately, they must lead others into battle knowing that the lives of those they lead are highly dependent upon the quality and availability of the equipment, gear and logistics elements that go with them. Holding less than 100% of the RO for any item is a situation that needs to be corrected. Users will hold the highest inventories possible, up to and over what the RO allows. Due to the impact of a lower than average or allowed operational availability in terms of performance appraisals from superiors and standing with peers, users petition their chain of command to increase the unit's RO on items the user believes it to be inadequate.

D. SUMMARY

In summary, the current DoD supply structure was designed to provide the highest levels of readiness for combat units and their support elements. This system was not designed to promote low inventory levels, and until recently inventory levels were not a major concern.

Since the mid-1980's organizations such as the GAO have conducted numerous studies into the inventory management practices of DoD. These studies cover topics

including: warehousing (GAO/NSIAD-95-64), cost savings (GAO/NSIAD-96-156), growth in parts inventories (GAO/NSIAD-90-100; GAO/NSIAD-90-111), changes in overall inventory (GAO/NSIAD-94-235), reengineering and best practices (GAO/NSIAD-94-64; GAO/NSIAD-96-5), and changing beliefs, values and cultures (GAO/NSIAD-92-105; GAO/NSIAD-94-193) to name a few. Some studies have compared DoD to prominent private sector businesses recognized as having highly effective inventory management systems such as Motorola, 3M, Du Pont, Federal Express, et al. (GAO/NSIAD 92-105) and British Airways (GAO/NSIAD 96-156).

One requirement of a highly effective management system (inventory or otherwise) is using performance measures that directly support the organization's mission. DoD's mission has been to have a highly mobile military force, capable of deploying on a moment's notice. The current supply system attempts to support that mission. Now, efficiency and effectiveness are required by the public. However, if the performance measures of Item Managers, Inventory Managers and users are not changed to include efficiency considerations as well as readiness, their behaviors will not change and inventory levels will not be lowered.

The question then becomes, "What performance measures are needed to motivate these three groups of people to reduce their inventory levels?" That is the focus of the next chapter.

III. PERFORMANCE MEASURES DESIGNED TO REDUCE INVENTORY

An organization's performance results from the performance of each individual in the organization. For an organization to achieve a specific performance goal, the performance criteria against which employees are measured must be related directly to the desired goal. Each employee then must function at or above a specified level of performance for each criterion set by the organization, and they must be rewarded for doing so. In order to develop performance measures that will achieve an organization's goals, the organization must have an understanding of individual motivation and reward systems and how they relate to performance. Expectancy theory is a useful model for understanding this relationship.

This chapter discusses the Expectancy theory of employee motivation through performance measures and rewards. It also discusses performance measure-reward disconnects within DoD's supply system. Then it applies these concepts to develop performance measures that may reduce inventory levels in DoD.

A. INDIVIDUAL BEHAVIOR/PERFORMANCE: EXPECTANCY THEORY

Psychologists have conducted a great deal of research over the years to try to determine why employees act as they do, and how to get them to behave the way the organization wants them to. The originator of the concept of "expectancy," Victor H. Vroom, cites the ancient Greek philosophers' principle of "hedonism" as the basis for

what has since developed into Expectancy Theory. Hedonism is based upon the assumption that:

> . . . in every situation people select from alternative possibilities the course of action which they think will maximize their pleasure and minimize their pain (Vroom, 1964; p. 9).

Over the years, studies such as those done by Porter and Lawler (1968), Dachler and Mobley (1973), Lawler (1973), Lawler and Suttle (1973), Locke (1975), Nadler and Lawler (1977), and Kanfer (1990) have shown Expectancy Theory to be a comprehensive theoretical tool for understanding work motivation in organizations (Pinder, 1984). Figure 3.1 is a graphic representation of Expectancy Theory showing the three key elements of motivation and the connection between motivation and performance. Expectancy theory is based upon four assumptions about the causes of behavior in organizations. The terminology used in this thesis is from Nadler and Lawler (1977).

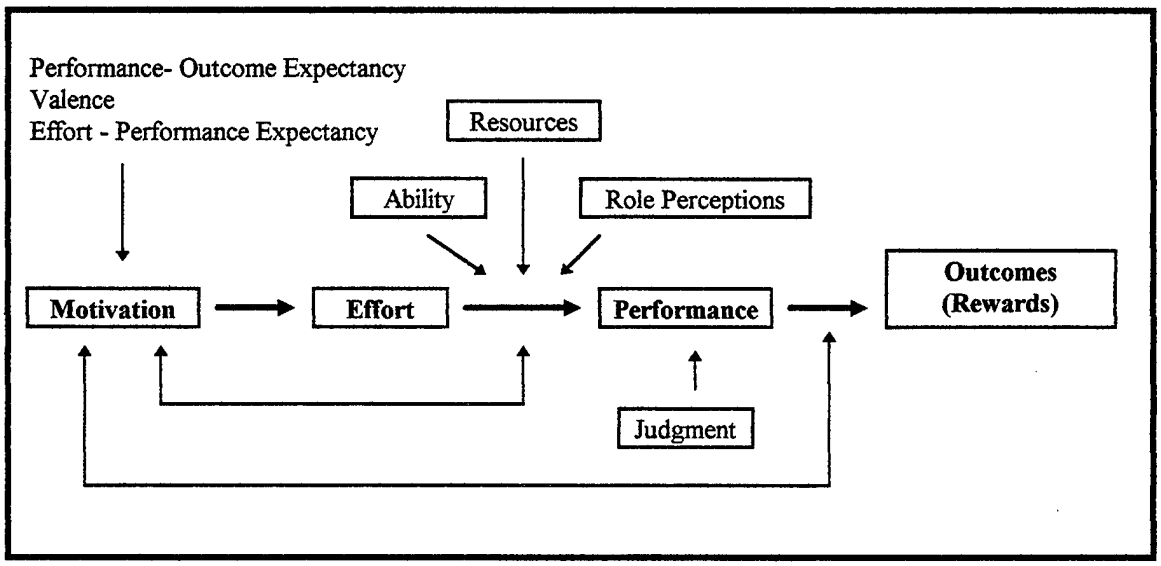

Figure 3.1 Expectancy Theory

1. Assumptions of Expectancy Theory

The first assumption of expectancy theory is that behavior is determined by a combination of forces in the individual and forces in the environment. Neither the individual nor the environment alone determine behavior. People have unique sets of needs, ways of looking at the world and expectations about how organizations will treat them. The work environment provides pay structures, supervisors, resources and reward systems that influence people's behavior. Different environments tend to produce different behavior in similar people just as dissimilar people tend to behave differently in similar environments.

The second assumption is that people make choices about their own behavior in organizations. Most of the behavior observed in organizations is the result of individuals' conscious decisions. Individuals make decisions about coming to work, staying at work and how much effort they will put toward performing their jobs while they are at work (Nadler and Lawler, 1977). Effort is an individual choice.

The third assumption is that people have different types of needs, desires and goals. Individuals differ on the kinds of outcomes or rewards they desire. One individual may be satisfied at his or her current level of responsibility and pay, while another individual desires a much greater scope of responsibility and increased pay. If both are offered an opportunity for promotion, the first individual may decline while the second immediately accepts. Also, a parent may want paid vacation days and increased family

health benefits, while a single individual may prefer the cash equivalent in his or her paycheck.

The final assumption is that people make decisions among alternative plans of behavior based upon their expectation of the degree to which a given behavior will lead to desired outcomes. In other words, "that which gets rewarded, gets done" (Fields, 1996).

The basis of expectancy theory is that people are neither innately motivated nor unmotivated; they respond (make choices) based upon the situation they are in and how it fits their needs. An organization, such as DoD, must accept this and take it into account when developing the performance measures and reward systems for its employees.

2. Employee Motivation

Based on these assumptions, expectancy theory states a number of propositions about motivation and the process by which people make decisions concerning their own behavior in organizational settings. Expectancy theory comprises a series of observations about behavior. Three key concepts are the basis of motivation according to expectancy theory:

1) Performance - Outcome expectancy;

2) Valence; and

3) Effort - Performance expectancy.

a. Performance - Outcome Expectancy

An individual associates every behavior with a set of outcomes. A person expects that if he behaves a certain way, there is a probability that certain things will occur. These outcomes can be seen as either positive or negative by the individual. Performance-Outcome expectancies range from a probability of 0 (seeing no connection between performance and an outcome) to a probability of 1 (being certain that the outcome will follow the performance). Individuals believe that certain levels of performance will lead to approval or disapproval from supervisors or peers. Performance - outcome expectancies are reinforced over time as experience is gained each time a behavior occurs and receives a response. Each performance can be seen as leading to a number of different outcomes. The more often an item manager is rewarded for high order fill rates, the stronger the expectation that having a high order fill rate will result in a reward. If high order fill rates cease to be rewarded, the performance - outcome expectancy will lower over time.

b. Valence

Each outcome has a "valence" or anticipated value to a specific individual. The same outcome will have different valences to different individuals. This occurs because "valences result from individual needs and perceptions which differ because they, in turn, reflect other factors in the individual's life" (Nadler and Lawler, 1977).

Valences range in value from -1 (punishing) to 1 (rewarding), with 0 indicating that an outcome is neither punishing nor rewarding. An example of valence differences would include one commander valuing high levels of spare parts inventory to maintain a certainty of readiness (e.g. valence of 1), while a different commander does not want to invest his or her discretionary budget in this manner (e.g. valence estimated at about -.6).

c. Effort - Performance Expectancy

In an individual's mind each behavior also is associated with a certain expectancy or probability of success. This represents the individual's perception of how difficult it will be to achieve a level of performance. For example, an Item Manager responsible for several items may be certain that he or she can fill an incoming requisition for one item (probability of 1), be equally certain that he or she will be unable to fill an order for a different item (probability of 0), and be somewhat certain of filling an order for a third item (probability of .5) if the order is below a certain size.

d. Other Factors

An individual's level of motivation determines the amount of effort he or she is willing to expend to perform the job. However, other factors also have an impact on this process. Although this thesis does not discuss these factors in depth, they do bear mentioning. First, the individual's *ability* to do what is being asked of him or her is a

compilation of natural aptitude, experience and training. If the individual does not have, or does not think he or she has, the ability to perform at the desired level work performance will suffer.

The individual's access to necessary *resources* such as tools, equipment or consumable supplies, affects his or her performance. If the necessary resources are not available, the employee is unable to perform. Inability due to lack of resources is different from inability due to lack of aptitude, experience, or training.

The individual's *role perceptions* of the roles he or she and his or her coworkers play in achieving organizational goals or missions can either help or hinder performance. Where roles and the relationships between roles is unclear, performance will suffer because the individual does not know what performance criteria are expected of him or her, or how the organization benefits from his or her performance. The impact of ability, resources and role perceptions on motivation are depicted by a feedback loop in Figure 3.1.

Finally, employee perceptions regarding how a supervisor *judges* his or her performance also affect employee motivation in terms of whether or not the performance will be repeated. If an individual believes that his or her performance will be judged harshly regardless of his or her effort, the probabilistic values of their performance - outcome and effort - performance expectancies will be lower than they were initially.

e. Summary

An individual's motivation to perform or act in a certain way is greatest when:

1) The individual believes that he or she is able to perform at the desired level (Effort - Performance Expectancy);

2) The individual believes that the behavior will lead to outcomes (Performance - Outcome Expectancy); and

3) The individual believes that these outcomes have positive value for him or her (Valence).

Algebraically, the decision making process resembles this equation (Vroom, 1964; p 27). The expectancy value in the equation is the Performance-Outcome expectancy multiplied by the Effort-Performance expectancy.

$$\sum \left[\text{Valence of outcome } J \right] \times \sum \left[\text{Expectancy that act } K \text{ will result in outcome } J \right] = \text{Motivation to perform act } K$$

For all acts K and outcomes J

Given alternatives, an individual will choose that level of performance which has the greatest motivational force associated with it, as indicated by the person's expectations, valences and outcomes (either the strongest positive or the weakest negative outcomes).

B. FORMAL REWARD SYSTEMS

From an organizational perspective, expectancy theory suggests that an effective organizational design involves an exacting and thorough diagnosis by its managers to determine clearly the goals of the organization, to define precisely the roles and desired outcomes within the organization, and to identify the relevant forces in the individual and the relevant forces in the environment which combine to motivate different kinds of behavior (Nadler and Lawler, 1977). Then it is necessary to develop a rewards system (e.g., pay, bonuses, promotions, job assignments, etc.) to bring about the desired performance behaviors by providing different outcomes for different individuals. Figure 3.2 depicts this iterative process. "The premise is that performance is the output; if a firm wants performance, it must be able to reward it" (VonGlinow, 1988). This is accomplished by tying together performance - outcome expectancies and valences in the manner described by the earlier equation. As depicted in Figure 3.2, rewards are to be a direct result of performance as measured by the organization. It follows, therefore, that if an individual's performance measures do not directly support organizational goals, a

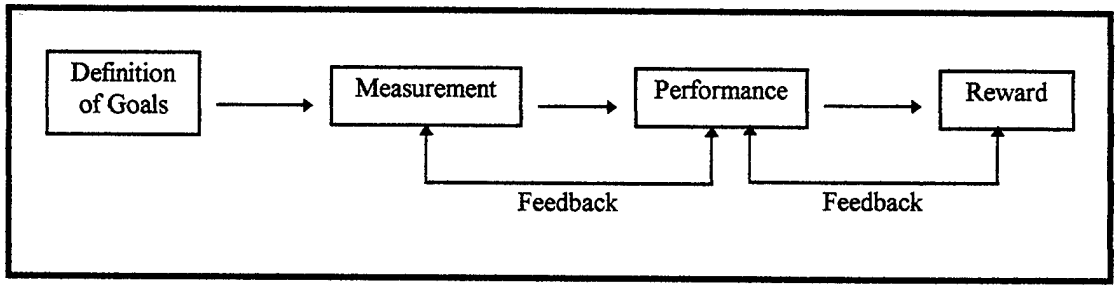

Figure 3.2 The Performance-Reward Relationship

reward system based upon these performance measures will not be effective in bringing the organization closer to achieving these goals. This is true for DoD as well.

Unlike commercial businesses that can design and tailor their reward systems to best accomplish their goals, federal employees and supervisors are constrained by law as to the rewards that may be given. Each agency of the Executive Branch has its own personnel system, however they all operate under the same legal constraints. Until recently, monetary rewards for civilian personnel were limited to annual bonuses of no greater than two percent of the employee's annual salary. The Army has since done away with that cap (Underwood, 1996), but the Navy's policy is a 1.5% maximum (Carpenter, 1996). Civilians also may receive "on the spot" cash awards of $25 to $250 per award for exceptional day-to-day performance. They also may be awarded up to 80 paid hours off per year in lieu of or in addition to, monetary awards. Special Act awards range from $25 to $10,000 per award and are designed as a reward for long term project contributions within or outside of work. All civilian awards are paid from the command's civilian personnel account, and award approval is affected by mission and funding constraints. (Underwood, 1996; Carpenter, 1996)

For military personnel, the primary means of rewarding significant contributions to the command or service is the award of a Letter of Commendation or medal. While these do not have any monetary value, they are worth one and two points each, respectively, added to promotion score composites However, the composite scores required for promotion are so high that these additional points are not a significant motivating factor. It is possible for military personnel to receive a monetary reward

under the Beneficial Suggestion award program. However, this is a long, drawn out process designed to accept ideas that result in large scale changes, ignoring smaller improvements. Military personnel also can be granted time off ("special liberty") within certain additional constraints.

Recognition, in its various forms, is the paramount means for rewarding military and civilian employees, yet in the author's experience it is also the least uniformly applied. Some commands and departments expend a great deal of time and effort to recognize their people. Other units do not, citing lack of time to do the sometimes lengthy paperwork required to nominate people for awards. It has also been the author's experience that commands that consciously devote the time to recognizing their personnel, even in non-monetary ways, have significantly higher morale overall, due in large part to the employees' belief that the command values them.

C. GOAL - PERFORMANCE MEASURE DISCONNECTS

A goal - performance measure disconnect is a situation where an organization's performance measures are not directly linked to or do not support the desired goals of the organization. Goal - performance measure disconnects occur primarily when the goal (desired outcome) of the organization is not clearly defined, where competing goals conflict with each other, where roles within the organization are unclear, where performance metrics are not easily quantifiable, or where the relationship between performance measures, rewards and outcomes are not clear or visible. Where significant ambiguity is present, some individuals are rewarded for performance that does not

achieve the organization's desired outcomes (goals), while other individuals, whose performance does contribute to desired outcomes are not rewarded at all.

As DoD struggles to define its role in the future, it also is attempting to determine how best to become more efficient while remaining effective at what it currently does (Cusick, 1996), a situation fraught with ambiguity. In the meantime, performance measures for Item and Inventory Managers have remained the same, continuing the focus on readiness. This situation results in a disconnect between the organization's goal of effective secondary material supply and efficient inventory practices, and the individual performance measures being used.

As an example, the Item and Inventory Managers' primary performance measures are order fill rates and backorder age (Chapter II). The manager's performance - outcome expectancy is high (probability of .8 or higher) that if order fill rates are high and backorder age is low that he or she will do well on performance appraisals, continue to be employed and possibly receive a bonus and recommendation for promotion (Nixon and Wolfe, 1996; Brownfield and Santy,1996; Park, 1996). Holding lower inventory levels may result in a lower performance - outcome expectancy since the manager is not rated on the amount of inventory being held. Research indicated that holding high levels of inventory has a high valence value to managers (value near 1), since order fill rate is a performance measure. Holding less inventory while meeting demand has a valence near 0, because it does not affect the manager either positively or negatively. However, lowering the amount of inventory held, and then being unable to fill a requisition has a valence value near -1 (punishing) because this lowers order fill rates and results in poor

marks on the manager's performance appraisal. Therefore, Inventory Managers are motivated to maintain high inventory levels so that the manager feels certain (probability value near 1) that he or she will be able to fill a requisition for every item managed when a requisition arrives. Once this relationship is understood, DoD can develop performance measures tied directly to available rewards.

D. PERFORMANCE MEASURES THAT MAY RESULT IN LOWER INVENTORY LEVELS

This section discusses three performance measures that, when included as part of the performance appraisals of persons within and using the DoD supply system, would promote lower inventory levels.

1. Inventory Turnover

Inventory Turnover is a quantifiable measure obtained by dividing the cost of goods sold (or issued), by the average inventory on hand of each item during the period. The goal of the manager is to achieve as large an aggregate Inventory Turnover value as possible.

The calculation is straightforward and simple. The information is easiest to obtain for small accounts (unit level) and facilities with high levels of automation providing total asset visibility to Item and Inventory Managers. Direct vendor deliveries (DVD) are included in the cost of goods sold, but add no value to average inventory as the material was not handled or held by DoD. This provides managers an incentive for DVD use. It

is also a cost saving measure for DoD. Those items that can be purchased only in bulk from the manufacturer are evaluated separately, as this is outside the manager's control. An example of this type of item is military aircraft tires, which are manufactured in a single production run each year, so the year's demand must be purchased at once. "Life-of-Type" purchases of spare parts for new weapons systems also come under this provision.

This performance measure is in addition to current measures and should be weighted equally with order fill rates to obtain the optimal balance between efficiency and effectiveness. Equal weighting would prevent the Order Fill Rate measure from promoting high "just-in-case" inventory levels, while at the same time preventing the Inventory Turnover measure from promoting inventory reduction to levels which would cause critical shortages and impair readiness. Threshold levels for each performance measure should be set appropriate to the item's criticality to combat effectiveness.

2. Total Costing

Total Costing places responsibility on Item and Inventory Managers to manage the overall cost of providing an item to the user. The most commonly used method for accomplishing this is the economic order quantity (EOQ) model (Figure 3.3). This model incorporates item procurement or ordering costs, along with the cost of holding and managing the item. Its purpose is to determine the optimal number of items to order at a time and the number of times to order per period to meet demand for the lowest total cost.

$$Q^* = \sqrt{\frac{2 * D * S}{I * C}}$$

Q* = Optimal Ordering Quantity
D = Annual Demand S = Order Cost
I = Carrying Cost as a % of Inventory Value
C = Item Value

Total Cost = Annual Ordering Costs + Holding Cost of Average Regular Inventory + Holding Cost of Safety Stock

Figure 3.3 Basic Economic Order Quantity and Total Cost Models

While every branch of service uses variations of the basic EOQ model shown in Figure 3.3, research indicates that the ordering and holding cost values are "educated estimates" and "best approximations" due to the inability of the current federal accounting system to support accurate direct cost assignment and indirect cost allocations (Park, 1996; Morefield and Moore, 1996). One drawback of the EOQ model in Figure 3.3 is that it assumes that no stockouts occur. Accurate Total Costing requires that stockout costs be included; however, stockout costs are even harder to quantify than holding costs. If the cost of a stockout is not quantified, an Item or Inventory Manager is likely to assume that the cost is infinitely large to the organization (lost lives, lost wars) and to themselves personally (low order fill rates and high backorder ages). As a result, the manager will carry large inventories.

Total Costing requires an accounting system that assists activities to accurately track direct and assignable costs, and to allocate indirect and common costs to the activities in which they engage. The ability to do so would enable Item and Inventory

Managers to manage their inventories better by balancing the costs of procuring, holding and transporting materials to the customer.

Total Costing encourages Item and Inventory Managers to investigate ways to increase the cost effectiveness of their operation. Any improvement (reduction) in the total cost incurred is a positive element on performance appraisals. Item or Inventory Managers could be recommended for a bonus for achieving certain cost reductions (i.e. 5% or 10% overall) while keeping customer support at or above previously set thresholds.

Adding Inventory Turnover and Total Costing criteria to performance appraisals would link them to the performance - outcome expectancy that is established for current criteria, adding efficiency to the performance requirements for achieving the desired reward (continued employment, bonus, consideration for promotion). This would result in a positive valence for Inventory Turnover and Total Costing behaviors as well.

3. Separate Readiness Criteria

Unlike Inventory Turnover and Total Costing, this criterion is not quantifiable. A clearer separation of accountability for readiness levels would be beneficial to unit commanders. This factor is designed to separate lower readiness levels due to poor management, which should reflect on the commander, from lower readiness levels due to item non-availability from the supply system, something over which unit commanders have no control. Although this separation may be intuitive, in practice unit commanders are held to stringent readiness requirements regardless of the reason for low readiness.

Even when superiors attempt this separation, a unit commander's peers may inadvertently exacerbate the situation simply by briefing their troops about a short notice deployment due to the other unit's lack of readiness. Disgruntled troops tend to translate this situation into a lack of leadership, regardless of whether it is a leadership or a material problem. This can damage the reputation and professional standing of the unit commander.

It is likely that a philosophical shift at all levels of DoD must occur for an effective separation to be established between these two reasons for readiness deficiencies. Poor management, lack of planning and weak leadership are important issues that need to be reflected on users' performance appraisals, but material deficiencies due to the supply system's inability to provide needed items should reflect only on those responsible for the provision of these items.

E. SUMMARY

This chapter discussed the relationship between individual employee motivation and performance measures that accurately reflect the organizations goals. It also has suggested the addition of three additional performance measures which, when used in conjunction with those already in use, should increase the likelihood of Inventory and Item Managers reducing the amount of inventory held in DoD and other federal storage facilities. In addition, this chapter discussed the limited rewards available to government employees, military and civilian alike.

There are other forces internal and external to DoD which indirectly, but significantly, affect inventory levels in DoD. These forces must be recognized and addressed as well, if efficient and effective inventory management is to become commonplace. These forces are the subject of the next chapter.

IV. IMPEDIMENTS TO CHANGE

Effective use of the additional performance measures of Inventory Turnover and Total Costing requires changes to the current system. This chapter discusses some of the issues and factors that impede the change process. Some of these factors are internal to DoD, and others are external to DoD.

A. INTERNAL TO DOD

Factors internal to DoD are those issues that DoD has some control over and has the authority to change. There are seven significant factors internal to DoD that impact inventory management capability.

1. Definition of "Excess"

One impediment to change is the lack of a single definition of "excess" inventory. A heated debate is ongoing, fueled by GAO reports citing that DoD has excess inventory levels. While conducting research for this thesis, the author learned that DoD does not have a set definition of "excess." LTGEN Cusick, Office of the Joint Chiefs (J4), commented that "excess is in the eyes of the beholder." He indicated that DoD is focusing on doing the "smart" thing, rather than simply rushing into doing something quickly (Cusick,1996). Mr. De Haven, Deputy Chief of Staff - Combat Development for

the US Army's Training and Doctrine Command states that "what is fat for one is muscle for another" (DeHaven, 1996).

Despite not having a clear definition of "excess," the primary reasons for current "excess" inventory levels are:

1) Base realignment and closures: Disbanded units' RO material is transferred and held at other installations, which results in those installations holding inventory levels over and above their RO level ("excess").

2) Weapons System Modifications: When a service purchases a weapon system, it often purchases the number of spare parts it expects it will need over the expected life of the weapons system. As the system is modified, the spare parts become obsolete and thus become excess inventory.

3) Support of Allies: DoD retains some older versions of weapons systems and the associated repair parts needed to support foreign military sales and treaties. These inventories are "excess" in terms of U.S. military needs.

2. Technology

A second impediment to change is the lack of an information system integrated throughout DoD and the service branches. While conducting research for this thesis, the concern most often voiced by Item Managers, Inventory Managers and users is the lack of an integrated information system that can provide total asset visibility (TAV). The services have only recently begun fielding this capability service-wide. The Air Force is the farthest along in the process. Without such capabilities Item and Inventory Managers work with incomplete data collected during physical inventorying.

Technology that supports TAV requires a large financial investment to develop and implement. It also requires that the supply and logistics elements within DoD arrive at a consensus about the format to be used. DLA and the service branches are in the early

stages of developing the software to allow DLA's inventory information system to interface with the service branches' systems (Oakley, 1996). This is a huge undertaking requiring time, a significant level of cooperation throughout DoD and ongoing financial support. The services disagree on what the system should look like, do, and what information elements are important. The ultimate goal is to have TAV at the DoD level as well as at the individual service level.

3. The Accounting System

A third impediment to change is the lack of an accounting system that is flexible enough to provide useful cost data to management. Government agencies receive their funding from a variety of congressional appropriations that can include hundreds of stipulations about where, by what process, and how much money can or must be spent and on what. Over the years, these Congressional directions have caused large and highly complex accounting systems to develop, which are designed to track and control agency compliance in each area covered by these stipulations. The accounting systems in use in the federal government are very fragmented. Accounting codes used by the system are designed ultimately to link expenditures with the original funding authorization account to preclude over spending.

These codes are almost impossible for an untrained person to understand (e.g., the first line of accounting data in a change of duty orders consists of about 52 characters and spaces). Further, it is very difficult for an accounting department to identify and aggregate direct, indirect and allocated costs in a meaningful way to allow a command of

any size to know how much it costs to perform a particular aspect of the unit's mission. For example, the pay, benefits and monetary awards for civilian personnel are part of a unit's budget, but the same cost elements for military personnel are not. Until unit commanders have accurate, complete cost information they will have limited success controlling those costs.

4. Focus on Immediate Results

A fourth impediment to change is the brief period of time that military personnel spend in a given job or position. Throughout DoD, at every level, from the most junior to the most senior positions, an individuals' performance is measured by what was accomplished during his or her tenure in a particular job or position. These performance appraisals support or undermine the possibility of the incumbent receiving future positions of increased responsibility and prestige. Therefore, there is a tendency to focus on short-term projects that begin to pay off prior to the transfer of the initiator. Long-term projects with more lasting benefits can be ignored if initial investments required are high and the credit will go to a successor.

5. Distrust of the Supply System

A fifth impediment is ongoing distrust in the reliability of the supply system, resulting in stockpiling and over-prioritizing of requests for secondary items. The image of an unreliable supply and logistics system is so ingrained in the folklore of the military

service, that it could take a generation or more of flawless customer service to soften the stigma. However, the availability of secondary items is crucial to the readiness of combat and logistics support units. This distrust and the fact that a stockout can cost lives result in users occasionally placing a higher priority code on a requisition than the item warrants, hoping that it will result in faster receipt of the item. This practice can hide poor inventory management at the user level and may result in another unit's readiness being degraded due to its inability to obtain the same item.

6. Training

A sixth impediment internal to DoD is the lack of uniformity of the training of supply personnel. One GAO Report identified a lack of uniform and regular training in modern logistics practices as a significant cause of excess inventory in DoD. It proposed that Item and Inventory Managers are not as effective as they could be due to lack of training in modern inventory management practices. The service branches all use initial training courses for their military officer and enlisted supply personnel, and each service's training programs focus on its individual supply system regulations and procedures. (GAO/NSIAD 94-193; p. 4).

Research shows that a great deal of training is available to military and civilian personnel in the DoD's supply systems, and all the Item and Inventory Managers interviewed had received training in subjects such as EOQ models, Just-in-Time Inventory, and TAV. They also reported that these modern methods are being used in DoD, and that they actively attempt to identify additional areas in which to implement

these practices. The expanding role of DVD is one example of modern inventory method implementation. (Nixon and Wolfe, 1996; Park, 1996; Brownfield and Santy, 1996; Benson, 1996; Tully and Bellinger, 1996).They did acknowledge, however, that access to training opportunities can be haphazard for many junior-level civilian employees due to low manning levels and funding for training. Therefore, the training of civilian supply clerks more often involves informal on-the-job training than formal classroom instruction.

7. Readiness Concerns

An additional factor affecting inventory management is the concern that readiness not be compromised. The unresolved question of the future role of the military has a side effect of slowing significant change to the supply system pending a set direction for DoD as a whole. From a readiness standpoint, "no one knows exactly where we are and where we want to end up" (Cusick, 1996). The philosophy of the current military supply system is predicated on high levels of combat readiness. It is unlikely this focus will change. As such, DoD is wary about setting or changing policies while it wrestles with this issue. Meanwhile, the supply system is constrained regarding how best to determine what to stock, how much to stock and the strategic placement of that stock.

B. EXTERNAL TO DOD

Factors external to DoD are those issues that DoD does not have control over and lacks the authority to change or adapt to DoD's needs. There are two primary factors external to DoD which impact its inventory management capability.

1. Funding

The U.S. Constitution gave Congress "the power of the purse" stating that no federal funds will be disbursed without Congressional approval. This provision is the basis of the annual budgeting process. Federal funding of executive branch agencies typically comprises thirteen appropriations bills, of which the DoD authorization is one. Once the appropriation is passed, the Office of Management and Budget (OMB) apportions the authorized funds on a roughly quarterly basis.

The method by which DoD receives its funding is a significant impediment to long term improvements and upgrades to the equipment and methods used to manage inventories within DoD. The annual Congressional appropriation and OMB apportionment process results in a significant amount of financial uncertainty from year to year within federal agencies. Ongoing budget reductions, the changing role of the U.S. military in world affairs and the need to respond to "hot spots" around the world at a moment's notice make it difficult for DoD to depend upon its ability to fund and implement long-term cost-saving and efficiency-improving measures which require large investments of resources up front.

2. Focus on Immediate Results

The military has been criticized from time to time about the short duration its leaders spend in important policy-making jobs, typically two to three years in any one position. The concern, as discussed earlier in this chapter, is that this promotes a short-term "quick fix" focus rather than a long term benefit focus.

Much like those in DoD, Congress and Executive branch appointees also are judged by what took place while they were in office. These judgments made by the American public either support or counter the incumbent's chances of being re-elected or re-appointed to future positions of increased responsibility and prestige. U.S. Senators serve a term of six years, while those in the House of Representatives serve only two years between elections. Cabinet appointees typically serve about four years (the span of a presidential term), although some serve under more than one presidential administration. This lends itself to a near-sighted focus, and consequently he or she has a tendency to focus on short-term projects that will pay off during his or her term in office. Long-term projects with benefits lasting more than one election cycle may be ignored if the initial investment of time and/or money is high, the benefits would accrue to a district other than the initiator's, or the credit can go to someone other than the initiator. Congress could change the frequency of the budgeting process, but decreasing the frequency decreases the impact that some members of Congress can influence over the budget, which in turn limits their ability to provide for their districts and thus their chances for re-election.

C. SUMMARY

This chapter discussed several issues that impact and limit the ability of DoD to change. DoD is attempting to develop a useful, accurate definition of "excess inventory," and is slowly making progress toward TAV through integrated information technology. However, these changes are costly and, due to the nature of the organization, also are very time intensive, requiring the cooperation of all the branches of service and DLA.

The issues discussed that are outside DoD's control will not change. Congressional control over the budget and the budgeting process were designed in by the authors of the Constitution, as were the lengths of Congress-members' terms in office. One Congress may reach consensus in support of DoD's efforts, but the next election can alter the membership of Congress, changing the level of political and financial support DoD receives.

This thesis acknowledges the impact of such occurrences, as well as the fact that some of the issues and factors that impede change in DoD have been designed to do just that. How then does DoD implement the performance measures discussed in Chapter III, given the impediments discussed in this chapter? This question is answered in the next chapter.

V. IMPLEMENTATION OF DIFFERENT PERFORMANCE MEASURES AND REWARDS

The performance measures discussed earlier can be implemented, but it may be costly. In order for the performance measures to be most effective, the impediments identified in the previous chapter must be taken into account, and DoD must address and resolve to the greatest extent possible those issues that it can control or modify.

A. IMPLEMENTATION OF INVENTORY TURNOVER

Implementation of Inventory Turnover as a performance measure requires, as a minimum, an accurate accounting of inventory on hand as of the date of implementation. At the unit level a 100% physical inventory count, reconciled with an automated inventory information system, is preferred wherever possible. This data will be the beginning inventory figure for the calculation. Also, a minimum of two years of accurate demand data should be compiled and evaluated for trends and cycles prior to setting a criterion standard for employee success. Inventory and Item Managers should complete training on data collection and Inventory Turnover computation at least three months prior to the commencement of Inventory Turnover criterion use.

The people to be evaluated and their supervisors should be involved in the initial data collection process, and the completion of the 100% inventory should be timed to coincide with the start of the next performance appraisal cycle. Employee involvement lends credibility to the beginning inventory figure, while adding a check for the person

assisting in the data collection, as well as a potential increase in the valence of this activity to the employee. The timing allows the employee to be evaluated against the new performance criterion for the entire appraisal cycle, limiting confusion about what the individual is expected to do and when.

As inventory information systems within and between the services and DLA are integrated, this performance measure should be added to the performance criteria of the individual overseeing that level of the supply process. A typical step implementation process would be:

1) Unit/Platoon/Squadron level,
2) Brigade/Wing level,
3) Base/Division/Group level,
4) Area level,
5) Region level,
6) Service level, and
7) Full integration between services and DLA.

Steps 1 through 3 refer primarily to retail level supply activities, and steps 4 through 6 typically incorporate wholesale level activities. Seamless integration of inventory management technology requires ongoing and reliable funding levels to complete. As each successive level of integration occurs, the ability of the supply system to respond to readiness issues can be expected to increase.

The time needed for the implementation of Inventory Turnover as a performance measure will depend on the level of automation and TAV system integration available at a particular site. It is expected that those areas that have TAV information systems in place will be able to implement Inventory Turnover faster than those areas that are still awaiting that capability. Based on the level of automation available and the rate of fielding additional TAV capabilities by the service branches, the author expects that the majority of units will be able to implement Inventory Turnover within the next three to five years. It may take longer for service branch systems to be fully integrated with DLA's system. This long range time-frame can be expected to conflict with the ongoing focus on immediate results, requiring that actions toward this end be rewarded by the chain of command in order for them to continue to occur. The impediment areas of "excess" definition, the structure of the accounting system and distrust in the supply system do not have a significant impact on the implementation of the Inventory Turnover performance measure.

B. IMPLEMENTATION OF TOTAL COSTING

Implementing Total Costing as a performance measure requires Item and Inventory Managers to have access to accurate cost breakdowns of what each element of mission achievement actually costs, including stockout costs. Total Costing requires that direct and indirect costs be identifiable and traceable to the unit element incurring those costs. It requires that the salaries and benefits of military personnel be included in these costs. Since military personnel costs are a direct Congressional appropriation, they are

not a budget element for individual commands and as such are largely ignored, while civilian pay accounts are monitored closely because this account is a budget element for each unit.

Total Costing also requires that the general and administrative costs and overhead costs be accurately computed and assignable to the mission specific elements of the unit. General and administrative costs include the salaries and benefits of the Commanding Officer, Executive Officer and the unit's administrative staff, as well as the consumables, office equipment and cost per square foot of the space they occupy (leased offices and facilities). Overhead costs include utilities, cleaning contracts, groundskeeping, etc.

The current accounting system used by DoD does not allow for this degree of accuracy in cost accounting. This system is designed to track expenditures by appropriation category to preclude over-spending (or under-spending in some cases) the Congressionally appropriated amount. Defense Business Operating Fund activities are using total cost concepts in their operations, however, due to the accounting system used in DoD, the surcharge added to the cost of the item purchased is based on a best estimate of the cost, true costs are unknown (Park, 1996; Morefield and Moore, 1996).

In order for Total Costing to be effective, the accounting system and software technology used by DoD must be modified or changed to allow comptrollers to accurately track the real cost of doing business. However, once costs can be accurately tracked, unit personnel can better utilize the total cost concept described earlier. Training in accurate data collection and the use of Total Costing should be accomplished about six months prior to the incorporation of this criterion into performance evaluations

in order to maximize the effort-performance expectancy of the individual. Implementation should begin at the start of the new performance appraisal cycle. This criterion need not be limited to Item and Inventory Managers, but is applicable to anyone in the organization who incurs costs.

In many cases the Total Costing tools are already in place. The implementation of the Total Costing criteria depends on funding the necessary software changes, focusing on long-term gains instead of short-term results and compiling accurate data on which to use these tools. The impediments of the definition of "excess," distrust of the supply system and readiness concerns do not impact the implementation of Total Costing as a performance measure

C. IMPLEMENTATION OF SEPARATE READINESS CRITERIA

Separate readiness criteria implementation should be designed to assist unit commanders in managing inventory more effectively. This may involve a shift in attitude throughout the chain of command and will require training in performance criteria design. The author suggests that readiness degradation caused, by either the lack of repair and spare parts in the supply system or the system's inability to respond in a timely manner, be addressed separately from readiness degradation caused by poor inventory management or lack of planning. The repercussions to unit commanders from these two very different causes of lowered readiness tend currently to be the same. This performance-outcome expectancy on the part of the unit commander along with a distrust

in the supply system's ability to provide materials can result in carrying additional inventory which may be labeled "excess."

Poor management and lack of planning do and should reflect on the unit commander's performance appraisal. However, if the systemic problem of lack of inventory availability is addressed separately from the unit commander's management ability, significant positive outcomes can be expected. Initially, the commander will have less fear that his or her career is in jeopardy. This, in turn can significantly reduce the number of requisitions placed in the supply system with artificially high priority codes. A reduction in the number of high priority orders allows the supply system to concentrate on filling requisitions for units whose need of those parts is critical. This reduces the level of chaos for Item and Inventory Managers, providing a more stable environment in which to plan. When units receive critical items when needed, trust in the system increases, reducing the amount of inventory ordered above demand requirements. In turn, the amount of inventory held at all levels of the system is decreased, a highly desired outcome for DoD.

This process is a beneficial repeating cycle, and will require a lengthy period of time to pay off but, when coupled with the other performance measures discussed, is an excellent way of creating and supporting an organizational culture which rewards efficient and effective inventory management and a focus on long term results. The impediment areas of technology and the accounting system have minimal impact on the implementation of separate readiness criteria. A standard definition of "excess" would be helpful but is not necessary for implementation.

D. REWARD SYSTEM CHANGES

A significant issue of the federal reward structure is the variability found in how it is administered, both between and within DLA and the service branches. Each DoD component has its own view of what constitutes an effective reward system and what administrative constraints to place upon supervisors. How the reward system is used varies widely between commands within each service as well, with some commands formally rewarding as many of its employees as possible and other commands rewarding very few of its personnel, weakening the performance-outcome expectancy for many military and civilian employees.

The service branches should remove any constraints they have imposed that is in addition to DoD guidance. Uniform guidelines for each level of award, military and civilian, need to be developed and published. Extensive and consistent training of military and civilian supervisors in all DoD departments is needed on the purpose, intent and administration of DoD's reward structure. This training would address military and civilian awards and should be conducted at military installations by mobile training teams comprised of DoD staff or a joint service instructional team. The result of these activities is to increase the equity in administration of awards for military and civilian employees.

The military reward system is fairly straightforward in design, but easily influenced by the personal preferences of each individual commander. The training should be focused on reducing the number of award level variances between commands

as well as between the services. Military personnel are eligible for few monetary awards, so recognition awards become even more critical to their level of motivation (Performance-Outcome expectancy).

Civilians are eligible for several levels of monetary awards, and the criteria for awarding each of these is fairly well defined. The critical element to the civilian reward system is the need to link individual performance measures with rewards and reward those who deserve it. The Navy's system has a set minimum award for those who are rated overall as "succeeding" in their job. This requirement causes difficulty when attempting to recognize a stellar employee from a limited civilian award budget. Training in this area should address writing performance criteria elements, what the options are for supervisors who wish to reward a civilian employee, and ways of determining appropriate levels of award compensation.

Implementing these changes in the current service reward systems may require a great deal of persuasion to convince all the service branches that this is the right thing to do. This course of action can be expected to be lengthy. Once a consensus is reached, however, the implementation of the training aspect of this change also will take a great deal of time to develop and to complete the initial outreach. The start-up costs of conducting the training will be high, but will decrease somewhat after the initial training circuit of installations is complete.

E. SUMMARY

This chapter discussed the implementation of Inventory Turnover and Total Costing performance measures, the separation of readiness measures from supply issues, and changes to the DoD reward system. The implementation of each of these changes will take time and require an ongoing commitment of resources for multiple years. These changes can result in lowered inventory through:

1) Adding the requirement for efficiency to the need for effectiveness from the supply system;

2) Making significant changes to an accounting system which does not provide the information necessary for cost-efficient management of inventory;

3) Relieving some of the pressure unit commanders operate under in an area that impacts the ability of the supply system to operate efficiently; and

4) Expanding supervisory ability to reward good performance, creating a closer link between performance measures and outcomes for inventory and item managers.

These changes will not be fast, and they will be expensive up front. However, if these changes are made, they can provide long-term benefits which will improve tremendously the effectiveness and efficiency of inventory management in DoD.

VI. SUMMARY AND CONCLUSIONS

A. SUMMARY

The goal of this thesis was to identify and recommend those changes needed in the current incentive and reward structure necessary for developing and supporting efficient and effective inventory management within DoD. First, the current DoD supply structure was discussed. The supply system is structured to provide the highest readiness levels possible for combatants and their support elements. Ongoing scrutiny has indicated that DoD's inventory management can be much more efficient. Current performance measures being used in the supply system center around order fill rates and backorder age. These performance measures affect inventory practices by promoting high on-hand inventory levels.

Next, a model for individual motivation was developed, and its relationship to performance studied. Organizational performance results from the performance of the individuals in the organization. Individual motivation is a function of the individual's expectancy that he or she is capable of performing at the desired level and the expectancy that an outcome will follow an action coupled with the valence of that outcome. It then tied this motivation to performance measures and rewards, and it described the formal performance rewards available in the federal system. Additional performance measures of Inventory Turnover, Total Costing and Separate Readiness Criteria were suggested as means to motivate Item and Inventory Managers and users to lower on-hand inventory

levels by linking these additional performance measures to formal rewards available to employees.

The impediments to change were then reviewed. Issues internal to DoD including the lack of a single definition of "excess," lack of sufficient information system automation, an accounting system that does not provide useful cost data, distrust in the supply system, a focus on short-term results, readiness concerns and training were addressed. The issues external to DoD of funding and a focus on short-term results were acknowledged as well.

Finally, implementation needs for the proposed performance measures were developed, given the impediments present, in order for the supply system to manage DoD's inventory more efficiently and effectively.

B. CONCLUSIONS

Inventory reduction in DoD can be accomplished. It will not, however, be quick and easy. First, it is necessary that Inventory and Item Managers' performance be measured with criteria that support inventory reduction. This thesis suggests the addition of Inventory Turnover and Total Costing as quantifiable performance measures, and the separation of readiness criteria as a non-quantifiable measure. Implementation of these performance measures can increase the efficiency and effectiveness of the inventory management system by reducing a manager's likelihood of being rewarded for carrying high levels of inventory.

Second, changes are necessary in the way DoD conducts business in other areas, as well as within the supply chain itself. DoD supply system personnel are highly skilled at meeting and exceeding the performance criteria by which they are graded. If DoD desires that Item and Inventory Managers and users behave differently, DoD must formally identify and reward the desired behaviors, or they will not occur. The incorporation of the additional performance measures discussed links the desired behaviors to the employee reward system. DoD needs to educate its members and support the actions necessary to improve the equity of application of the DoD reward system across all levels of the organization.

Finally, DoD needs to take additional steps for the inventory management system, as well as these performance measures, to be most effective and efficient. These additional steps are:

1) Continue information system technology fielding and integration in support of TAV. Once TAV capability is in place DoD can take steps to reduce redundancies within and between its components with the confidence that required stock levels are being maintained;

2) Modify the accounting system to support the identification and aggregation of cost data to enable unit commanders to better manage costs. Until DoD has an accounting system that can easily and accurately assess its actual costs, it will continue to have limited success managing them;

3) Define "excess." A standard definition of excess is required if excess inventory is to be eradicated throughout DoD; and finally,

4) Define the future role of the U.S. military. Without a clearer purpose or direction, DoD will be unable to determine the changes needed that will move it in the direction it wishes to go.

C. FURTHER RESEARCH

This thesis focused on performance measures, their impact on DoD inventory levels, and reward systems. It also acknowledged the impact of other factors on inventory levels. Areas of further research suggested by this research are: devising a DoD standard definition of "excess," developing an accounting system modification model to improve the usefulness of DoD's accounting system, and developing a curriculum and an implementation plan for DoD reward system training with the purpose of decreasing variations in the reward system's application.

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APPENDIX. INTERVIEW QUESTIONS

1) What is the organization's definition of efficient and effective inventory management?

2) How are these concepts passed on to inventory managers?

3) What inventory management activities or behaviors are encouraged? Discouraged?

4) What benefit(s) are received by an inventory manager who takes a calculated risk and is successful (no stockout occurs)?

5) What is the response when an individual's calculated risk is unsuccessful (a stockout occurs)?

6) Are there any behaviors that the (service) says they want but do not reward?

7) Are there any behaviors that the (service) says they do not want but do not penalize?

8) In your opinion, what would aid the (service branch)'s ability to reduce its inventory of secondary items?

9) In your opinion, what is an impediment to reductions in inventory?

The questions asked of the Deputy Joint Chiefs of Staff (Logistics) and his staff were more general in nature, relating to strategic and mission /readiness policies and issues.

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