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MBA PROFESSIONAL REPORT

ECONOMIC VALUE OF ARMY
FOREIGN MILITARY SALES

December 2015

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ECONOMIC VALUE OF ARMY FOREIGN MILITARY SALES

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ECONOMIC VALUE OF ARMY FOREIGN MILITARY SALES

ABSTRACT

This project identifies current sources of cost savings and cost avoidance generated through Army foreign military sales (FMS). Using a comparative high-low case-study approach, a high-demand volume case and a low-demand volume case were selected in major weapons categories. The cases were analyzed on an internal basis to determine cost savings, cost avoidance, and public value. Once the cases were analyzed and compared against each other, advantages or trends in cost savings, cost avoidance, and public value became apparent. Upon completion of our analysis, we determined that cost savings were usually gained from reduced system unit costs due to higher economic order quantities, reduced overhead costs per unit, and reduced unit costs resulting from manufacturing learning curves. Additional costs were avoided by reducing gaps in production lines. Furthermore, we determined that the Army's FMS strategy needs improvement in order to take full advantage of these sources of cost savings and cost avoidance.

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LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|------------|--|
| AECA | Arms Export Control Act |
| APUC | Average Program Unit Cost |
| ASA (ALT) | Assistant Secretary of the Army, Acquisition, Logistics, and Technology |
| CBO | Congressional Budget Office |
| CBP | Customs and Border Patrol |
| COCOM | Combatant Command |
| CRS | Congressional Research Service |
| DASA (DEC) | Deputy Assistant Secretary of the Army, Defense Exports, and Cooperation |
| DAU | Defense Acquisition University |
| DCAA | Defense Contracting Audit Agency |
| DCS | Direct Commercial Sales |
| DFAS | Defense Finance and Accounting Service |
| DHS | Department of Homeland Security |
| DISAM | Defense Institute for Security Assistance Management |
| DOD | Department of Defense |
| DODD | Department of Defense Directive |
| DOS | Department of State |
| DSCA | Defense Security Cooperation Agency |
| EOQ | Economic Order Quantity |
| FAA | Foreign Assistance Act |
| FAR | Federal Acquisition Regulation |
| FMS | Foreign Military Sales |
| FMSA | Foreign Military Sales Act |
| GAO | Government Accountability Office |
| HASC | House Armed Services Committee |
| IFB | Invitation for Bid |
| IOC | Initial Operational Capability |
| IMET | International Military Education and Training |

| | |
|--------|--|
| ITAR | International Traffic in Arms Regulation |
| LOA | Letter of Offer and Acceptance |
| LOR | Letter of Request |
| MILDEP | Military Department |
| MSA | Mutual Security Act |
| PAUC | Program Acquisition Unit Cost |
| PBL | Performance Based Logistics |
| PEO | Program Executive Office |
| POTUS | President of the United States |
| RFI | Request for Information |
| RFP | Request for Proposal |
| SA | Security Assistance |
| SAMM | <i>Security Assistance Management Manual</i> |
| SC | Security Cooperation |
| SCO | Security Cooperation Office |
| SECDEF | Secretary of Defense |
| SFA | Security Force Assistance |
| TUAS | Tactical Unmanned Aerial System |
| U.S. | United States |
| USASAC | United States Army Security Assistance Command |
| USG | United States Government |

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I. INTRODUCTION

In 1976, the Congressional Budget Office (CBO) conducted an analysis to determine cost savings resulting from foreign military sales (FMS) at the request of the House Armed Services Committee. The 1976 CBO report, prepared by CBO's Budget Analysis Division, analyzed 35 weapon systems across the Department of Defense (DOD) and noted that only 50% of FMS resulted in a cost savings to the United States. The sales that were able to generate savings did so at a rate of 14 cents of savings for every dollar of sales (Capra, Schafer, & Renehan, 1976, p. ix). The study also found that the U.S. military industrial base and military programs have seen significant changes since 1976, warranting a current investigation of the FMS program's ability to generate economic value for U.S. taxpayers (Capra, Schafer, & Renehan, 1976, p. ix). The objective of this study is to address this need. This study develops a framework from which to analyze cost avoidance, cost savings, and public value and applies this framework to estimate the net benefit to U.S. taxpayers.

According to the Defense Security Cooperation Agency (DSCA) website, "The Foreign Military Sales [FMS] program is a form of security assistance authorized by the Arms Export Control Act [AECA] and a fundamental tool of U.S. foreign policy" (Defense Security Cooperation Agency [DSCA], n.d.-b). FMS functions as a strategic partnership program used by the United States Government (USG) to develop and maintain relationships with both foreign countries and the defense industry. According to the Defense Security Cooperation Agency, since 1950, the USG has realized over \$420 trillion in FMS with more than 200 different countries (DSCA, n.d.-b). In the current economic and budgetary climate, the USG needs to continually leverage FMS advantages to maintain the U.S. industrial base, in addition to reducing the capability gaps of our foreign partners.

Extant studies of the value of FMS make economic assumptions in regard to economies of scale. These reports do not go beyond the notion that increased production results in lower costs. However, research and practice suggest many alternative sources of value (e.g., learning curve, labor pools, common block upgrades). A deeper

understanding of the broad spectrum of potential sources of value will allow the USG to better leverage increased global demand and capture added value for the taxpayer. A current and more complete understanding of actual cost savings and cost avoidance of FMS will benefit the USG's entities—from the program office to the taxpayer—by allowing decision-makers to make more informed choices and capture more value from the FMS program.

The purpose of this study is to assess the impacts of the FMS program on the USG, the defense industry, and the U.S. taxpayer. This study

- identifies the DOD and Army FMS demand trends
- defines cost savings and cost avoidance
- creates a framework from which to analyze the impacts of FMS
- analyzes the barriers to leveraging FMS to generate cost savings and cost avoidances.

This study utilizes a comparative case study analysis (Eisenhardt, 1989; Yin, 2009) using two heterogeneous organizations, purposefully selected to represent the upper limit and lower limits of Army FMS sales volume. A case study design is appropriate when, as in this study, the researcher is answering how and why questions focused on contemporary events, and has no control over the associated behavior (Yin, 2009, p. 6).

This study finds that the largest recipient of FMS programs is the U.S. taxpayer. FMS clearly reduces the cost to procure a weapon system. However, cost savings are difficult to measure and do not necessarily increase the reinvestment opportunity of the program. Congruent with extant studies, this study finds that cost savings result from economies of scale. Additionally, cost savings are gained through international cooperative developments. These reduce the average program unit cost (APUC) by allowing the program office to negotiate economic order quantity (EOQ) reduction rates and share in the development costs of innovative technologies.

The remainder of the project is organized as follows: Chapter II describes the setting of the study, the organizations involved, and how the DOD and Army are

organized to support the FMS process. Chapter II also describes the FMS process and supporting definitions. Chapter III describes the research methods, including data sources, data, and analysis approach. Chapter IV presents the analysis and findings. Chapter V is a discussion of the recommendations and implications from analysis and findings. Chapter VI, the conclusion, provides a brief summary of our study.

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II. FMS OVERVIEW

A. DESCRIPTION AND HISTORY OF FMS

This section describes the history, background, and legislative acts that have led to the current FMS Program. It also details the major organizations involved in the FMS program and provides an overview of each organization's roles and responsibilities. Additionally, several reports from various organizations are assessed to discuss some current challenges with the FMS program.

1. FMS Overview

The FMS program is a non-profit program (Defense Institute for Security Assistance Management [DISAM], 2014, p. 65) governed by DOD Directive (DODD) 5105.38-M, also known as the *Security Assistance Management Manual* (SAMM). The SAMM states, "the United States Government (USG) may sell, grant, or lease defense articles and services to a country or international organization only if the President makes a determination that the prospective purchaser is eligible" (DSCA, 2012, p. C4.1.1). Countries buying defense articles or services through the FMS program pay an amount equal to what the USG pays, plus an additional surcharge. This additional surcharge is charged by DSCA and is used to recoup the cost of administering the FMS program (DISAM, 2014, p. 65).

FMS is a Security Assistance (SA) program managed by the DOD, through the DSCA. SA and Security Cooperation (SC) are two separate programs by which the United States can provide defense articles, services, and military training to partner nations. While SC and SA activities are similar, the statutes that authorize and fund them differ (DSCA, 2012, p. C1.1.2). All of the SC and SA activities support U.S. national security objectives and build partnerships with foreign nations (DSCA, 2012, p. C1.1.2). FMS is an SA activity that provides military articles, training, construction, and other services to foreign governments through cash sales, grants, loans, credit, or lease (DSCA, 2012, p. C1.1.2.2).

The FMS program is authorized and funded mainly by three separate laws: the Foreign Assistance Act (FAA) of 1961, the Arms Export Control Act (AECA) of 1976, and the Annual Appropriation Acts for Foreign Operations, Export Financing, and Related Programs. According to the FAA, AECA, and Executive Order 13637, “the Department of State (DOS) is responsible for continuous supervision and general direction of Security Assistance programs” (DSCA, 2012, p. C1.3.1). The DOS determines if there will be a program or sale for a specific nation, the size and scope of military training, and budget requests and allocation of funds for military assistance. The DOS also reviews and approves export license requests for Direct Commercial Sales (DCS) of defense articles (DSCA, 2012, p. C1.3.1). The DSCA summarizes the FMS program as follows:

The Secretary of Defense [SECDEF] establishes military requirements and implements programs to transfer defense articles and services to eligible foreign countries and international organizations. Within DOD, the principal responsible agencies for Security Cooperation (SC) are the Defense Security Cooperation Agency (DSCA), the Combatant Commands (CCMDs), the Joint Staff, the Security Cooperation Organizations (SCOs), and the Military Departments (MILDEPs). (DSCA, 2012, p. C1.3.2)

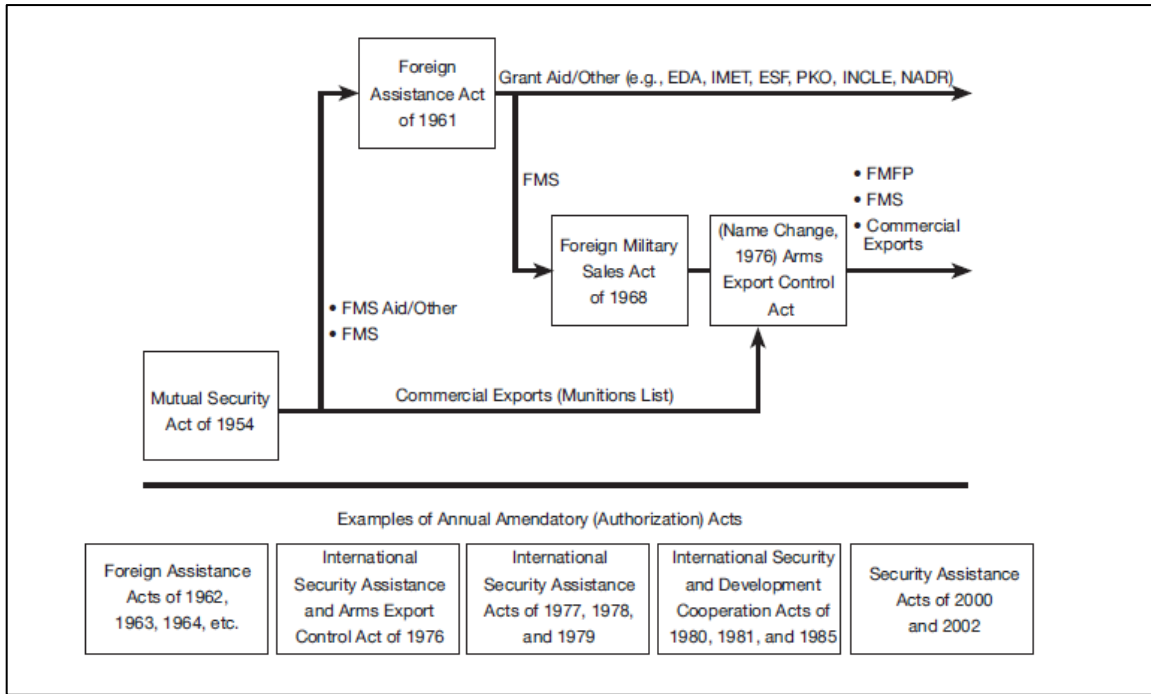
2. History of Foreign Military Sales

The FMS program is one of many SA programs. SA programs came to fruition through several public laws, such as the Mutual Security Act (MSA) of 1954, the Foreign Assistance Act of 1961, and the Arms Export Control Act (DISAM, 2015, p. 2–2). The current provisions of the FAA and AECA are a progression of earlier acts or laws. The FAA had many of the same provisions found within the MSA. The FAA is the authorizing legislation for the FMS program, International Military Education and Training (IMET) program, the Economic Support Fund (ESF), the Foreign Military Financing Program (FMFP), and others (DISAM, 2015, p. 2–1).

The AECA stemmed from the Foreign Military Sales Act (FMSA) of 1968. The authority for the FMSA was the FAA, which sought to incorporate foreign military sales in a new, separate act. Subsequently, the International Security Assistance and Arms Export Control Act of 1976 changed the title from FMSA to AECA. The AECA also

established authority for commercial licensing through the International Traffic in Arms Regulations (ITAR; DISAM, 2015, p. 2–2). Figure 1 shows the major security assistance authorization acts since 1954 and their relationship to the current FMS program.

Figure 1. Major Security Assistance Authorization Acts Since 1954



Source: Grafton, J. S. (Ed.). (2015, June 1). *The management of security cooperation* (34th ed.). Wright-Patterson AFB, OH: Defense Institute for Security Assistance Management, p. 2-2

B. SUPPORT AGENCIES

The FMS process is complex and requires oversight and coordination from several organizations. The DSCA is the DOD’s lead agency for FMS, with comparable organizations for each of the military services. As this study is focused solely on the Army FMS program, the organizations described are limited to those DOD and Army organizations involved.

1. Defense Security Cooperation Agency

The DSCA “directs, administers, and provides guidance to the DOD Components and DOD representatives to U.S. missions, for the execution of DOD SC programs” (DSCA, n.d.-a). The DSCA serves under the Assistant Secretary of Defense for Policy (ASD(P)), shown in Figure 2, and is responsible for managing defense trade and arms transfer, humanitarian assistance, international education, and training and defense institution building programs (DSCA, n.d.-a). The DSCA’s mission, vision, and principle functions are as follows:

Mission

Lead the Security Cooperation community (SCC) in developing and executing innovative security cooperation solutions that support mutual U.S. and partner interests (DSCA, n.d.-a).

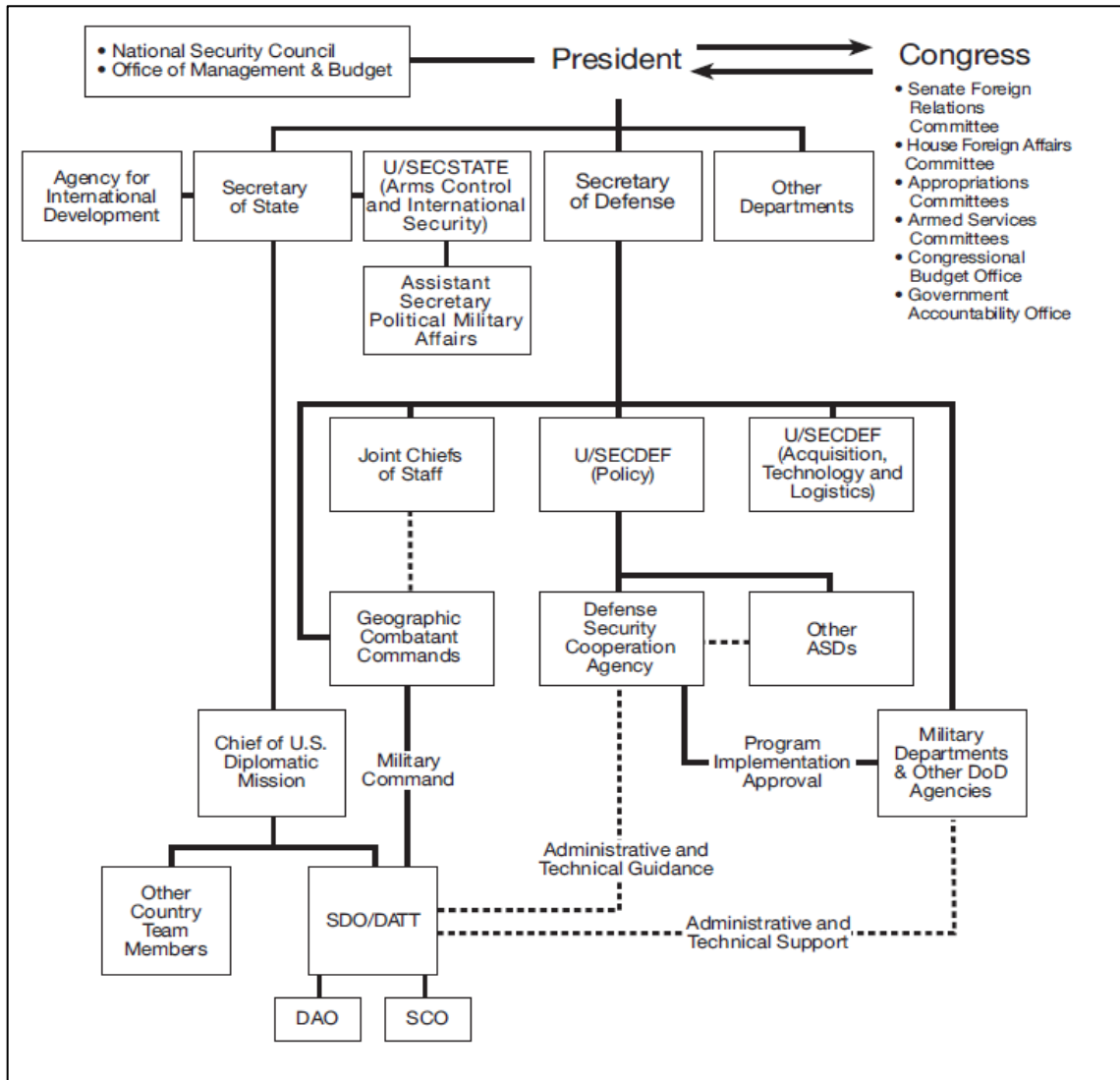
Vision

Enable a whole-of-government effort to build and maintain networks of relationships that achieve U.S. national security goals. (DSCA, n.d.-a)

Principle Functions

- Administering and supervising SA planning and programs
- Coordinating the formulation and execution of SA programs with other governmental agencies
- Conducting international logistics and sales negotiations with foreign countries
- Serving as the DOD focal point for liaison with U.S. industry with regard to SA activities
- Managing the credit-financing program
- Developing and promulgating SA procedures, such as the SAMM
- Developing and operating the data processing system and maintaining the macro database for the SA program
- Making determinations with respect to the allocation of FMS administrative funds
- Administering assigned security cooperation programs
- Administering the implementation of any assigned security force assistance (SFA) activities. (DISAM, 2015, pp. 3–12)

Figure 2. U.S. Government Organization for Security Cooperation and Security Assistance



Source: Grafton, J. S. (Ed.). (2015, June 1). *The management of security cooperation* (34th ed.). Wright-Patterson AFB, OH: Defense Institute for Security Assistance Management, p. 3-3.

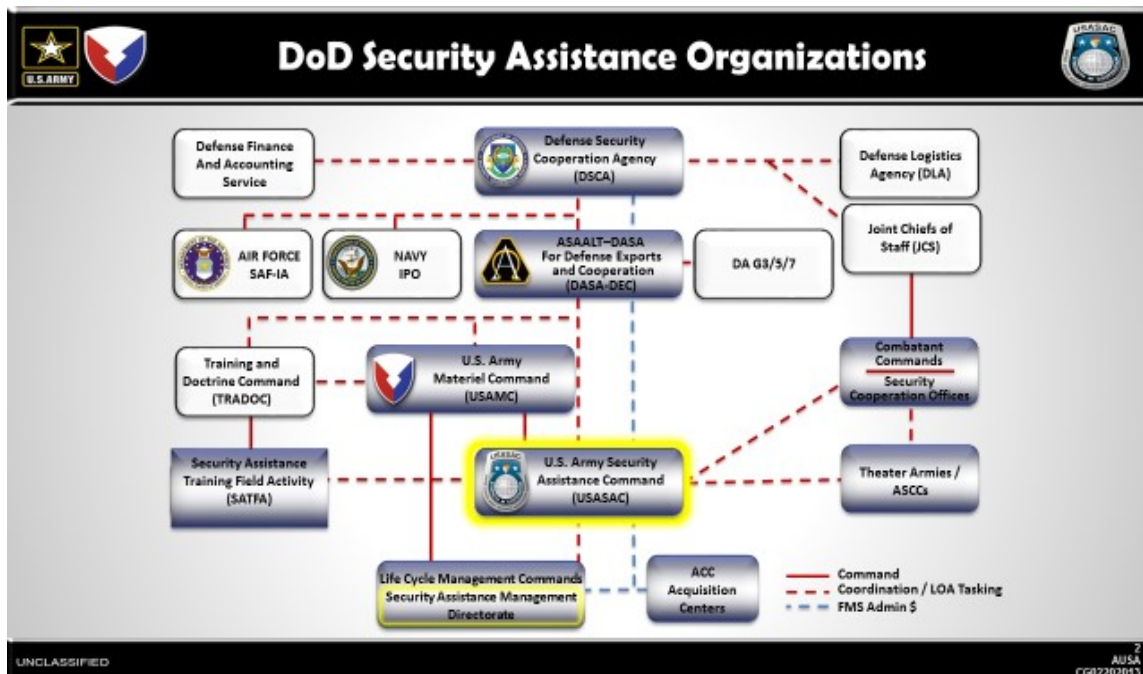
2. Deputy Assistant Secretary of the Army, Defense Exports, and Cooperation

The Deputy Assistant Secretary of the Army, Defense Exports, and Cooperation [DASA (DEC)] works directly for the Assistant Secretary of the Army for Acquisition, Logistics and Technology [ASA (AL&T)] and provides “SA policy, oversight, and resourcing for the Department of the Army” (DISAM, 2015, p. 3–16). DASA (DEC)

provides oversight and support for the U.S. Army Security Assistance Command (USASAC), while implementing the Army’s strategic partnership goals. DASA (DEC) also serves as a conduit between DSCA and the Army’s implementing agency, USASAC, as shown in Figure 3, by providing “quality materiel, facilities, spare parts, training, publications, technical documentation, sustainment and other services that AMC provides to U.S. Army units” (U.S. Army Security Assistance Command [USASAC], 2015). The DASA (DEC) mission statement is as follows:

To effectively transform the Army’s effort to proactively engage across the spectrum of security cooperation and have greater flexibility in satisfying changing global requirements. DASA DE&C is the U.S. Army lead for exports, technology transfer, armaments cooperation, and for equipping and training our international partners. Manage, lead and direct policy, resources, and strategy for the conduct of the Army’s global security cooperation programs with direct tasking authority over the Army’s designated Executive Agents for the execution of their delegated security cooperation responsibilities. (Assistant Secretary of the Army, Acquisition, Logistics, and Technology [ASA (ALT)], 2012)

Figure 3. DOD Security Assistance Organizations Relationships



Source: United States Army Security Assistance Command. (2014, February 20). AUSA USASAC Focus Forum. Huntsville, AL: Author, p. 5.

3. United States Army Security Assistance Command

The USASAC is the implementing agency for the U.S. Army's FMS program and its role is "to build partner capacity, support geographic Combatant Command engagement strategies and strengthen U.S. global partnerships (USASAC, 2015). The USASAC functions as the executive agent for the Army Material Command (AMC) and "is responsible for life cycle management of FMS cases, from pre Letter of Request, to development, execution and closure" (USASAC, 2015). The USASAC manages approximately 5,000 FMS cases in more than 140 countries each year, and provides training to more than 11,000 foreign soldiers annually (see Figure 4). USASAC's mission and vision statements are as follows:

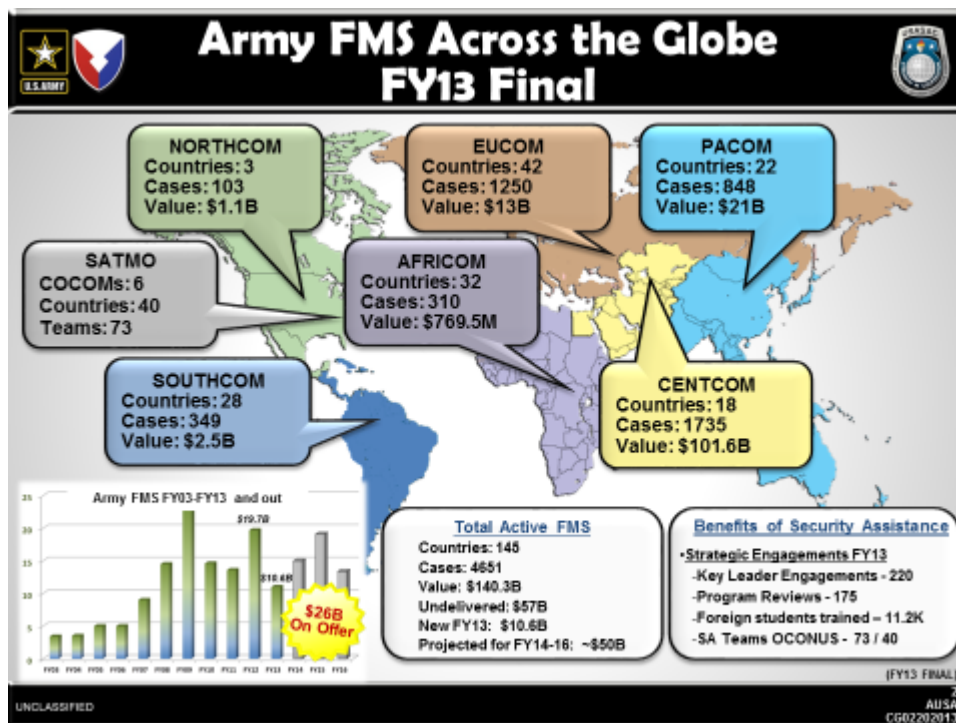
Mission

USASAC leads the AMC Security Assistance Enterprise, develops and manages security assistance programs and foreign military sales cases to build partner capacity, supports COCOM engagement strategies, and strengthens U.S. global partnerships.

Vision

The Premier Security Assistance Enterprise in the Department of Defense. A highly professional, skilled, and values-based workforce that generates trust in advancing U.S. strategic partnerships through exceptional security assistance and FMS programs. (USASAC, 2015)

Figure 4. Fiscal Year 2013 Army FMS Figures



Source: United States Army Security Assistance Command. (2014, February 20). AUSA USASAC Focus Forum. Huntsville, AL: Author, p. 2.

C. FOREIGN MILITARY SALES

Foreign nations may purchase military equipment and services through two separate programs. First, FMS is a government-to-government sale of weapon systems, support, and services. Second, commercial vendors may sell weapon systems, support, and services through direct commercial sales (DCS). DCS and FMS are two separate processes, each of which will be explained in detail in this section.

1. The FMS Process

The FMS process is similar to the DOD acquisitions process. The FMS process is conducted in three phases: pre-case development; case development; and implementation, execution, and closure (DISAM, 2015, p. 5–2). Pre-case development usually begins when foreign countries conduct a capabilities analysis and determine that they have a specific military need. Once the foreign government identifies a need, it begins to research procurement options and sources. After the foreign nation evaluates its options,

it may realize that no domestic or non-U.S. organizations or industries exist that can provide its need. At that point, the foreign government may initiate contact with the USG to procure defense articles, training, or services from U.S. sources, which could be obtained through commercial sources, through Direct Commercial Sales, or through the FMS program administered by the DOD and the DOS.

The FMS process begins by determining a country's eligibility to receive assistance through the FMS program. Table 1 identifies the four eligibility criteria that each country must meet in order to be eligible for FMS. Generally, defense articles are sold to foreign defense organizations that are under the control of a defense ministry. Additionally, a foreign defense establishment may only obtain the defense articles and services with prior approval from the DOS and DSCA. An eligibility determination is not a guarantee that a sale or transfer of defense articles will occur. Although a sale may be made, requirements of law or policy may prohibit the release of some items. Additionally, a sale of defense articles to a country may be stopped if certain social or security criteria are not met. This could include things such as unnecessary military expenditures, support to terrorists, illicit drug production or trafficking, default in payment to the USG in excess of six months, and others (DSCA, 2012, p. C4.T3).

Table 1. FMS Eligibility Criteria

| | |
|---|---|
| 1 | The President finds that the furnishing of defense articles and defense services to such country or international organization will strengthen the security of the United States (U.S.) and promote world peace; |
| 2 | The country or international organization has agreed not to transfer title to, or possession of, any defense article or related training or other defense service so furnished to it or produced in a cooperative project, to anyone not an officer, employee, or agent of that country or international organization, and not to use or permit the use of such an article or related training or other defense service for purposes other than those for which furnished, unless the consent of the President (Department of State) has first been obtained; |
| 3 | The country or international organization has agreed that it shall maintain the security of such article or service and provide substantially the same degree of security protection afforded to such article by the U.S.; and |
| 4 | The country or international organization is otherwise eligible to purchase or lease defense articles or defense services. |
| Source: Foreign Assistance Act of 1961, as amended (FAA) section 505(a) (22 U.S.C. 2314), and AECA section 3(a) (22 U.S.C. 2753). | |

Source: Defense Security Cooperation Agency. (2012, April 30). *Security assistance management manual*. Arlington, VA: Author, p. C4.1.1.

Once the foreign country’s eligibility is verified, the USG determines the amount of defense articles to be released, as well as the form of payment—cash, credit, lease, or other. All foreign governments must agree not to transfer defense articles, services, or related training to any other country without prior consent of the DOS. They must also agree to use the defense articles as intended, whether for legitimate self-defense, internal security, or to hinder the proliferation or use of weapons of mass destruction.

Like the USG, foreign nations generally prefer to compete the procurement of weapons systems, defense articles, training, and construction. This is typically done through a Request for Proposal (RFP), Request for Information (RFI), Invitation for Bid (IFB), or other formal request. The foreign nation may solicit RFIs from domestic or international markets. The foreign nation evaluates the proposals from both U.S. and Non-U.S. vendors and selects the offers that most closely meet its needs (DSCA, 2012, p. C4.3.1.1). When a foreign nation releases a solicitation through the appropriate channels, either the combatant commands (COCOMs) or the U.S. embassy in their country, the USG determines that solicitation to be a Letter of Request (LOR). DSCA reviews the

LOR, which initiates a process to determine if the USG should participate in the competition. The USG's participation could be through FMS, DCS, an International Cooperative Agreement, or combination of these programs (DSCA, 2012, p. C4.3.1.1).

Once the DSCA reviews and approves the LOR, the DSCA Case Writing Division (CWD) writes the Letter of Offer and Acceptance (LOA). After congressional notification is complete, the LOA is sent to the foreign defense ministry. The LOA is a formal offer from the USG to the foreign nation. If the foreign nation approves, the LOA is returned with an initial deposit to the Defense Finance and Accounting Services (DFAS)-Indianapolis. After DFAS receives the funds, a trust is established where funds are used as needed to pay for the articles or services. After the trust is established, the foreign nation can begin ordering articles, services, and training. The articles are then shipped, the services performed, or the training conducted. Two years after all articles, services, and training have been delivered or performed, the DFAS reconciles the records and submits the final bill to the customer, and the DSCA sends a closure certificate to DFAS.

2. Direct Commercial Sales vs. Foreign Military Sales

Direct Commercial Sales (DCS) allows foreign nations or customers to purchase defense articles, weapon systems, services, or training directly from defense contractors. DCS varies from FMS as the customer can go directly to the vendor without going through the USG. While the end result may be the same, the two methods of procuring defense articles or services vary.

FMS is a government-to-government relationship, whereas DCS is a traditional buyer-seller relationship. Using DCS to purchase articles or services, however, may not be approved if certain conditions are present. If the customer prefers and the situation permits, DCS may be used in lieu of FMS. Typically, DCS results in providing the military equipment or services faster. Although the process of obtaining those goods and services is generally quicker, the foreign nation will usually pay a higher price than had they used the FMS program. The FMS program sells the military equipment and services at the same price the USG would pay. Additionally, some vendors prefer FMS over DCS

as they are selling the military equipment and services to the USG and therefore need only adhere to U.S. law. Vendors who directly sell military equipment and services to a foreign nation are subject to that nation's laws and regulations. There are several other situations that might require one method over the other, which is discussed in greater detail in the following sections.

The USG prefers that foreign nations procure U.S.-made defense articles or services, but by law must remain neutral when it comes to the procurement method used by foreign nations. The USG government is not allowed to promote the military equipment or services it procures to foreign nations. The USG will not provide foreign governments a LOA if there is a DCS sale in progress, pending, or being negotiated. The USG's policy is not to compete with U.S. defense contractors or industry for foreign defense sales. Both FMS and DCS permit a foreign nation to purchase most military equipment or defense articles from the United States.

The method by which a customer purchases military equipment can depend on several factors. First, FMS-only sales are those where technology, security, and other concerns are present. Next, sales of new or complex weapon systems may require FMS licensing. Additionally, the sale of any technology or ammunition, whether complex or not, that requires increased control to prevent proliferation from terrorist organizations or rogue states requires licensing. Finally, sales of weapons systems may be made through both FMS and DCS channels. The separation of a weapons system into FMS and DCS components or end items allows customers to purchase only those components that must be transferred through the FMS process. Ultimately, the President of the United States (POTUS) has the discretion as to which weapons systems will be sold exclusively through the FMS process (DISAM, 2015, p. 15–2).

A U.S. defense contractor may request that the sale of defense articles or training be made using DCS rather than FMS. If the foreign nation prefers that the sale be made through DCS, the U.S. defense contractor submits the proposal to DSCA. Once DSCA approves the DCS preference, the item managers, security cooperation offices (SCOs), and other USG offices are notified. The foreign purchaser is also notified of the DCS

preference approval and advised to contact the U.S. defense contractor directly (DISAM, 2015, p. 15–3).

The purchase of a major weapons system by a foreign nation is not the end of the DCS or FMS process. Major weapons systems require life-cycle support to ensure their operational utility over their useful life. This support could come through either FMS or DCS channels. Even if a sale were made through FMS, the supporting equipment, services, or training could come through DCS. Conversely, sales made via DCS could rely on life-cycle support procured through FMS (DISAM, 2015, p. 15–4).

The USG is involved in both FMS and DCS sales. In both cases Congress is notified if the threshold dollar value is exceeded. In both FMS and DCS defense sales the DOS is the final approving authority (DISAM, 2015, p. 15–5). In FMS cases, DSCA contacts DOS to begin a new FMS case, while in DCS the contractor must have an export license approved by DOS. In either case, the sale of defense articles or services to a foreign nation must promote U.S. interests and policy.

3. GAO and CBO Reports Concerning FMS

The AECA was enacted in 1976; since then, there have been many Government Accountability Office (GAO) and Congressional Budget Office (CBO) reports concerning various aspects of FMS or various defense articles sold through FMS. The scope of this study is limited to Army FMS articles, services, or training, and thus this study relies only on reports focused on the U.S. Army and DOD.

In May 1976, the CBO produced two working papers to identify cost savings obtained through FMS and to identify the economic effects of FMS on the United States. These working papers were meant to describe how cost savings are obtained, the typical amount of saving, the types of programs that saw cost saving, and the economic as well as secondary effects of FMS, such as reduced weapons cost for the USG. These two working papers are the only reports that focused on the cost avoidance, cost savings, and the economic benefits of the FMS program as a whole.

The working paper titled *Foreign Military Sales and U.S. Weapons Costs* found that, for the most part, FMS did not produce significant cost savings. The CBO also found that reduced requirements on the U.S. military were hard to measure and that military weapons and technology sales were greatest to the Middle East, which only complicated matters (Fifer, Shafer, Capra, & Mantel, 1976, p. viii). The CBO stated that FMS cost saving came from two primary sources: recovery of research and development (R&D) costs and lower per-unit production costs. The report also mentioned that maintaining a weapon system's production line could be a third source of cost savings. Cost savings related to keeping the production line open are too difficult to measure, and depend on a number of assumptions. Additionally, there were also increased personnel costs related to the increasing number of FMS cases. The increased demand for FMS required additional personnel in order to facilitate the program (Fifer et al., 1976, p. 3).

According to the working paper, only a few weapons systems resulted in savings, which could be as high as 15% of the total weapons procurement cost (Fifer et al., 1976, p. 8). The CBO found that the single largest area of savings was from R&D costs. These saving were up to 8% of a weapons system's total R&D costs. The weapons programs that resulted in cost savings were usually sophisticated, state-of-the-art weapons programs such as missiles or aircraft (Fifer et al., 1976, p. 12). Additionally, these high-tech weapons programs needed to sell articles through the FMS program within the first five years of full-rate production (FRP) in order to see any savings at all. Furthermore, the sales of ammunition, artillery, and other military equipment where R&D costs had been absorbed resulted in little or no savings. The working paper went on to state that the most significant cost savings attributable to the FMS program might accrue because the FMS strengthens foreign nations resulting in decreased requirements on the U.S. military. While this may be true, cost saving resulting from stronger foreign nations and reduced U.S. military requirements are extremely difficult to measure (Fifer et al., 1976, p. 13).

In the second CBO working paper titled *Budgetary Cost Savings to the Department of Defense Resulting from Foreign Military Sales*, the CBO found that FMS delivered cost savings through five different categories. Those categories are R&D recoupment, economies of scale and learning curve effects, overhead, production line

gaps, and other (Capra, Schafer, & Renehan, 1976, p. ix). R&D recoupments are cost savings resulting from a surcharge that each foreign customer must pay when buying defense articles or weapons systems through FMS. Economies of scale and learning curve effects result in cost savings by reducing the per-unit production cost. Overhead costs are reduced as foreign customers pay for some of the overhead costs that may have otherwise been charged to the USG. Production line gaps are decreased when weapons systems or other defense articles are sold through the FMS program. This results in cost avoidance of production line termination and setup costs for the United States. Other cost savings could result when a foreign buyer assumes a portion of some cost that would have been paid by the USG. For example, this could be other nonrecurring costs such as building a new production facility (Capra et al., 1976, p. 5).

The CBO determined that only some of the sales through the FMS program resulted in a cost savings for the United States. In fact, CBO's analysis of 35 weapons programs, in fiscal years (FY) 1977–1981, determined that only 50% of FMS sales resulted in cost savings (Capra et al., 1976, p. 15). Sales of services, construction, and training did not usually result in a cost saving for the United States. For the sales that did generate cost saving, most of the savings were for R&D recoupment. For every dollar in sales, only 14 cents resulted in savings. Of those 14 cents, four cents were a result of R&D recoupments (Capra et al., 1976, pp. 15, 17). This working paper also acknowledged that high-tech weapons programs (such as missiles and aircraft) with significant R&D costs resulted in the majority of the cost savings from FMS. Other weapons systems or defense articles such as tanks and tracked vehicles, communications equipment, ammunition, and others resulted in either little or no cost savings.

A GAO report titled *Trade Offsets in Foreign Military Sales* found that trade offsets reduced the amount of cost saving from FMS. An offset is defined as the “coproduction, licensed production, countertrade, subcontracting, and technology transfer—mandated by foreign governments as a condition of sale” (Government Accountability Office [GAO], 1984, p. 1). Offsets reduce the amount of cost saving as they enable a foreign country to expand its industrial base, to the detriment of the U.S. industrial base and U.S. jobs. Offsets may also force a U.S. defense contractor to

purchase supplies and materials from the foreign nation. Offsets result in infrastructure and technology investments by vendors in purchasing countries who are seeking to improve sustainable domestic military production capability. (GAO, 1984, p. 2). These arrangements are directly coordinated between the foreign customer and the U.S. defense contractor. The USG is normally not involved in these types of agreements.

Proponents of trade offsets claim that sales agreements would not be as numerous without some form of trade offsets. There are also some who claim that trade offsets, such as technology sharing, allow commonality of equipment, create U.S. jobs, and foster better relationships between the United States and our allies (GAO, 1984, p. 4). Trade offsets may increase foreign sales, generate U.S. jobs, improve the U.S. industrial base, and decrease the per-unit price of goods due to longer production runs. Critics claim that trade offsets increase the cost of international defense procurement, base source selection by foreign customers of defense articles and weapons systems on criteria other than cost and performance, and threaten national security and U.S. defense contractors by allowing foreign government's access to new technology (GAO, 1984, pp. 5–6). Unfortunately, the data on trade offsets was not sufficient to make a definitive determination either way when this report was written in 1983.

Another report by the GAO, *DOD's Stabilized Rate Can Recover Full Cost*, found that the surcharge rate that the DOD applied to FMS, as of 1997, was not sufficient to recover the full cost of the executing the FMS program. The FMS program should operate as a no-profit, no-loss program by the USG. Therefore, the only costs above and beyond those of the military equipment, services, or training are those required by the USG to operate the FMS program. The GAO found that the existing rate was inadequate to cover all costs associated with executing the FMS program, specifically pension and post-retirement health benefits of civilian employees (GAO, 1997, p. 2). The report recommended a stabilized surcharge rate that would be applied to all foreign sales in order to cover the full cost of executing the FMS program over the long run. The Army undercharged foreign customers a total of \$7.2 million dollars between FY 1992-1996 (GAO, 1997, p. 9).

In the report *Changes Needed to Correct Weaknesses in End-Use Monitoring Program*, the GAO (2000) found that end-use monitoring of defense articles sold to foreign nations was ineffective. The GAO (2000) found that field personnel were not adequately informed or trained in the end-use reporting requirements (p. 4). At the time the report was written in August 2000, the DOD sold various defense articles and military equipment to dozens of different countries, with each country and type of equipment having different requirements in terms of end-use monitoring. As such, the DOD, specifically DSCA, failed to issue the necessary guidance and standard on end-use checks to its field representatives (GAO, 2000, pp. 8–9). Without clear, definitive monitoring guidance, the DOD’s field representatives were unsure when and how to monitor the end-use of defense articles and equipment in the country in which they operated. As a result, the DOD lacked the required information on whether or not foreign customers were properly using the defense articles and training provided to them through the FMS program. At the time of this report, the DOD lacked the necessary information required by the AECA because it failed to collect it (GAO, 2000, p. 8). This end-use information is valuable to Congress and to those involved in FMS, and COCOMs.

A 2004 GAO report, *Improved Army Controls Could Prevent Unauthorized Shipments of Classified Spare Parts and Items Containing Military Technology to Foreign Countries*, stated that the Army did not have adequate controls when sending foreign customers classified spare parts or unclassified items that contained military technology when they were part of a blanket order. A blanket order is a resupply action taken by the foreign government to purchase spare parts and other items for a specific dollar amount (GAO, 2004, p. 3). As part of these blanket orders, the Army must ensure that every item sent to the foreign customer is approved for transfer to that country. The GAO found that in some cases classified spare parts or items containing military technology were erroneously sent to foreign customers who were not approved to receive them. DOD policy does not allow for classified items to be transferred or released to a foreign customer under a blanket order. Furthermore, the GAO found that the Army failed to test the system used to ensure that countries were only receiving those items for which they had been approved. Additionally, the GAO (2004) found that the Army

lacked written standards that defined the recovery of classified items or military technology once a foreign country received them (p. 9).

In the 2009 report, *Foreign Military Sales Program Needs Better Controls for Exported Items and Information for Oversight*, the GAO found that the DOD, DOS, and Department of Homeland Security (DHS) lacked the necessary tools, policies, and procedures to effectively manage the FMS program (p. 2). On several occasions, FMS shipments were sent to foreign customers after the FMS cases were terminated. In these cases, Customs and Border Patrol (CBP) authorized FMS shipments to proceed after they had been cancelled. In another example, the DOD adjusted the surcharge rate on foreign sales without knowing if the new rate would cover all the administrative costs of executing the FMS program (GAO, 2009, p. 3). Finally, DSCA did not have adequate metrics that it could use to improve the FMS agreement development timeline. DSCA policy states that the all FMS sales agreements should be completed in 120 days or earlier. The GAO found that between January 2003 and September 2008, only 72% of FMS sales agreements were complete in 120 days or less. The GAO also found that sales agreement completion times ranged from less than one day to 1,622 days (GAO, 2009, p. 18).

The GAO had previously investigated the FMS program focusing on a variety of issues, some of which were stated earlier in this paper, and found that shipment issues were ongoing. DSCA is responsible for monitoring, tracking, and reporting deliveries of each shipment (GAO, 2009, p. 12). In most cases the shipments are sent by the USG to the country's freight service for shipment to their final destination. In other cases, foreign countries utilize the DOD's defense transportation system to ship military equipment. Regardless of the shipping method used, the DSCA failed to effectively track receipt of shipments. As previously mentioned, the DOD lacked the required information necessary to adequately report on end-use monitoring. The DOD also failed to obtain the necessary information needed to determine the FMS program's administrative costs. Additionally, the DOD did not conduct sufficient analysis in order to apply the proper surcharge rate needed to cover the administrative costs of running the FMS program (GAO, 2009, p. 20).

D. DEFINITIONS

In the subsequent section we define and explain key terms and concepts. These concepts include economic learning curve, economies of scale, overhead, and other concepts. The salience of these concepts became apparent through the course of this study. We define them here for clarity.

1. Learning Curve

The *learning curve* is simply defined as the rate at which the time or cost of performing a task decreases as the production output doubles. According to the *Defense Manufacturing Management Guide*, “Learning curve theorizes that people and organizations learn to do things more efficiently when performing repetitive tasks” (DMMG, n.d., para. 9.8.1). Learning curves were loosely defined by Ebbinghaus in the 19th century in the study of psychology and learning, but then later explained by Wright’s Cumulative Average Model in his 1936 report “Factors Affecting the Cost of Airplanes” published in the *Journal of Aeronautical Science*. Wright’s research found a nonlinear relationship between direct labor hours and learning, and determined that “direct labor hours decreased as companies experience learning” (“Quantitative Module E: Learning Curves,” 2015). In 1947, Crawford confirmed Wright’s research and further developed the Unit Curve Model, which “states that as the quantity of a product produced doubles, the recurring cost per unit decreases at a fixed rate or constant percentage” (Barber, 2011). Wright and Crawford’s models remain relevant in the manufacturing sector (Table 2) and have branched out to other business sectors, including “marketing, distribution and customer service and to costs other than labor costs” (Horgen et al., 2008).

Table 2. Example of Learning Curves

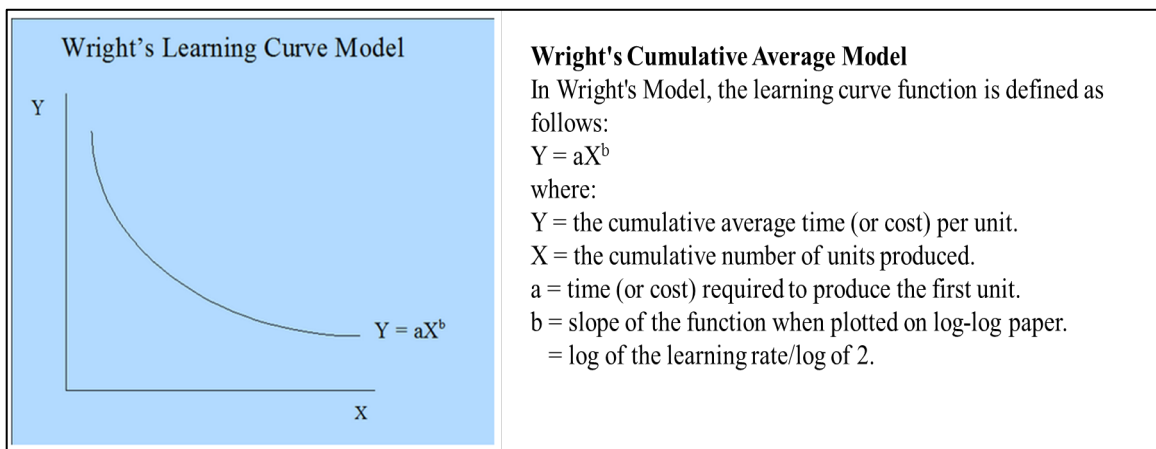
| EXAMPLE | IMPROVING PARAMETER | CUMULATIVE PARAMETER | LEARNING-CURVE SLOPE (%) |
|--------------------------------|---|------------------------|--------------------------|
| 1. Model-T Ford production | Price | Units produced | 86 |
| 2. Aircraft assembly | Direct labor-hours per unit | Units produced | 80 |
| 3. Equipment maintenance at GE | Average time to replace a group of parts | Number of replacements | 76 |
| 4. Steel production | Production worker labor-hours per unit produced | Units produced | 79 |
| 5. Integrated circuits | Average price per unit | Units produced | 72 ^a |
| 6. Hand-held calculator | Average factory selling price | Units produced | 74 |
| 7. Disk memory drives | Average price per bit | Number of bits | 76 |
| 8. Heart transplants | 1-year death rates | Transplants completed | 79 |

Source: Cunningham, J. A. (1980). Using the learning curve as a management tool. *IEEE Spectrum*, 17(6), pp. 45–48.

a. Cumulative Average Curve

Wright’s model operates on the assumption that the “direct labor man-hours necessary to complete a unit of production will decrease by a constant percentage each time the production quantity is doubled” (DMMG, n.d., para 9.8.5). His model helps calculate simple problems and allows for quick estimations for continuous production lines. The formula for Wright’s Learning Curve Model is shown in Figure 5.

Figure 5. Wright’s Learning Curve Model



Source: Martin, J. R. (n.d.-a). The learning curve or experience curve. Retrieved from <http://maaw.info/LearningCurveSummary.htm>.

b. Incremental or Unit Curve

Crawford’s model focuses on the “hours or cost involved in specific units of production and treats each lot as a separate reference point” (DMMG, n.d., para. 9.8.5). The unit curve model determines learning curve rates based on lots or batches rather than individual units. It also “predicts a higher cumulative total time to produce two or more units than cumulative average model, assuming the same learning rates for both models” (Rajan et al., 2008). The formula for Crawford’s model is depicted in Figure 6.

Figure 6. Crawford’s Model

| |
|--|
| <p>Crawford's Incremental Unit Time (or Cost) Model The equation used in Crawford's model is as follows: $Y = aK^b$ where: Y = the incremental unit time (or cost) of the lot midpoint unit. K = the algebraic midpoint of a specific production batch or lot. $= [L(1+b)/(N2^{1+b} - N1^{1+b})]^{-1/b}$</p> <p>where: K = the algebraic midpoint of the lot. L = the number of units in the lot. b = log of learning rate / log of 2 N1 = the first unit in the lot minus 1/2. N2 = the last unit in the lot plus 1/2.</p> |
|--|

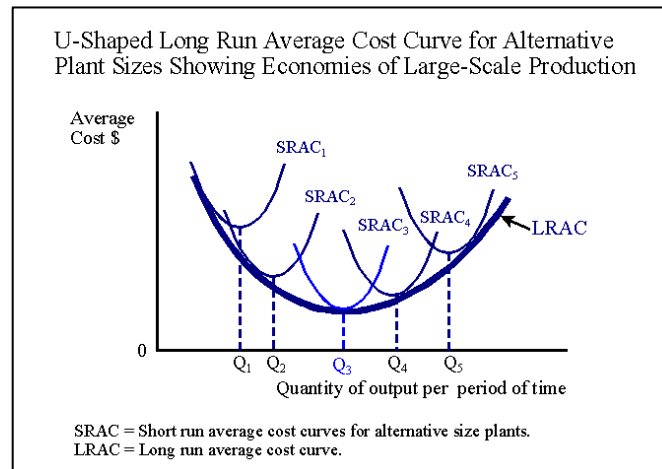
Source: Martin, J. R. (n.d.-a). The learning curve or experience curve. Retrieved from <http://maaw.info/LearningCurveSummary.htm>

2. Economies of Scale and Overhead

The concept of economies of scale is similar to learning curves in that while production output increases, the long run average production cost per unit decreases, as depicted in Figure 7 (Leiberman & Hall, 2000). Economies of scale demonstrate cost savings to an organization by allocating fixed costs over a larger number of products. Fixed costs are “costs that do not vary with the volume of business, such as property taxes, insurance, depreciation, security, and minimum water and utility fees” (DAU, n.d.-c). In the case of the Apache and Shadow programs, we are able to estimate cost savings by developing cost curves using estimated overhead rates and program acquisition unit

cost (PAUC). Overhead is defined as any expense that is not related to direct labor and direct materials in the manufacturing process, or “indirect costs that support a particular function of the company” (DAU, n.d.-d). This is particularly important for cost savings in FMS because those overhead costs will be allocated over a larger base. This is also true in the recoupment of research and development (R&D) costs.

Figure 7. Economies of Scale



Source: Martin, J. R. (n.d.-b). What are economies of scale? Retrieved from <http://maaw.info/EconomiesOfScaleNote.htm>

3. Production Line Start/Stop Cost

Production line start and stop costs are another cost avoidance factor associated with FMS. FMS is used to stabilize the industrial base of the United States by allowing production lines to remain open. Production demand for the USG is predicted through the budget and Congress, but may not provide enough demand to sustain a defense contractor’s production line. FMS is used to fill those gaps. The USG will use foreign demand to schedule production runs to prevent a line from stopping. The difficulty in estimating the cost avoidance associated with the start/stop of production line is determining when a lack of foreign demand would actually stop production and the company would divert resources to another project.

4. Performance Based Logistics

Performance based logistics (PBL) represents cost savings to the government through shared sustainment costs. According to DAU, PBL is “an outcome-based product support strategy for the development and implementation of an integrated, affordable, product support package designed to optimize system readiness and meet the Warfighter’s requirements in terms of performance outcomes” (DAU, n.d.-e). Both the DOD 5000.01 and the DOD 5000.02 require the program manager to employ performance based logistics strategies to enhance operational availability and reduce overall cost. PBL may be implemented at the system level or at the component level. This decision is made based on an approved sustainment strategy from the program office.

5. International Cooperative Programs

According to the Defense Acquisition Guide Book (DAG), “an international cooperative program is any acquisition program or technology project that includes participation by one or more foreign nations, through an international agreement, during any phase of a system’s life cycle” (Defense Acquisition Guidebook [DAG], 2013, para. 11.2.1). The DOD 5000.01 requires the program manager to consider international partnership at every phase of the acquisition process and leverage opportunities to reduce costs and increase interoperability with our allies. The DAG suggests that the decision process should consider the following:

Demonstrated best business practices, including a plan for effective, economical, and efficient management of the international cooperative program;

Demonstrated DOD Component willingness to fully fund their share of international cooperative program needs;

The long-term interoperability and political-military benefits that may accrue from international cooperation; and

The international program’s management structure as documented in the international agreement. The designated program manager (U.S. or foreign) is fully responsible and accountable for the cost, schedule, and performance of the resulting system. (DAG, 2013, para. 11.2.1.1)

6. Cost Avoidance

Cost avoidance as a general concept or term is relatively consistent in meaning for both government and industry. The DAU (n.d.-a) describes cost avoidance as a present action that is expected to decrease or eliminate costs in the future. However, actions that create cost avoidance often do not directly affect profit and loss. This makes cost avoidance actions less tangible because they are not direct savings that can be reinvested (Ashenbaum, 2006). As related to FMS, cost avoidance is most associated with costs that the government is able to avoid because of additional orders. In general, the volume or additional unit orders created by FMS allows government prime contractors to fill in production gaps. This prevents production line shut down costs and avoids costly startup and verification costs when the government reorders in the future.

7. Cost Savings

In general, government and industry seem to agree about how cost savings are created. However, depending on perspective, the tangible dollars achieved from cost savings may belong to industry profit or government savings. In either end state, the origin of the value is the same. The DAU describes cost savings as an action that results in a reduction in the anticipated level of costs in order to achieve a specific objective (DAU, n.d.-b). From an industry perspective, cost savings are generally directly traceable to profits and losses and are a direct reduction in expenses based on some change in process, technology, or policy (Ashenbaum, 2006, p. 2). As related to FMS, cost savings are most likely generated by increased economies of scale and spreading fixed costs across a larger allocation base. A challenge in determining actual cost savings is based on which side of the negotiation is able to capture more of the value. Depending on the contract vehicle in place, such as a Firm Fixed Price contract, industry may not be obligated to disclose a reduction in their overhead rates or favorable cost improvements in the supply chain. In the case of Firm Fixed Price contracts, any cost savings created is likely to be captured as industry profit. On the other end of the spectrum, Cost Plus contracts are more likely to create government cost savings, as all costs are reimbursable by the government. In the middle, Incentive contracts negotiate terms to split the benefit

of cost savings between industry profit and government savings. FMS can create savings; however, the particular contractual relationship between the government and industry determines who receives the tangible or spendable benefit.

8. Public Value

In the mid-1990s, Moore (1995) wrote extensively about the concept of public value. He specifically compared and contrasted techniques and methods that private industry managers and government managers used to assess the value they had created for their organizations (Moore, 1995, p. 28). The industry managers' private value stemmed almost entirely from the posting of profits or losses. In contrast, government managers are responsible for coordinating and providing those essential services the public pays for through taxation. They consistently must provide the most benefit for the least cost through efficiently and effectively achieving legislated objectives (Moore, 1995). These benefits include services such as national defense, policing, education, and emergency services. FMS produces public value in direct and indirect ways. From a defense perspective, selling capabilities to allied nations ensures that allies are capable partners. This potentially reduces manpower and fiscal requirements for the U.S. military in the future. FMS that creates cost avoidance is an example of a direct increase in public value. The sale has increased an allied nation's defense capability, making them more capable partners and reducing dependence on the U.S. military, and thus avoiding large sums of capital expenditures. An example of indirect FMS public benefits may stem from industry profits such as an increase in corporate tax revenue and a sustained employee income tax.

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III. METHODS

A. RESEARCH APPROACH

We conducted a comparative case analysis (Eisenhardt, 1989; Yin, 2009) using two organizations representing the upper and the lower limits of Army FMS sales volume. The comparative case study method is a well-suited research approach for this FMS project. A case analysis is most useful when the researcher is answering how and why questions focused on contemporary events with no control over the associated behavior (Yin, 2009, p. 6). Designs that rely on analysis of archival or survey data allow researchers to focus on developing specific answers to who, what, where, and how many or how much types of questions, but are less well suited to exploring how and why. Case study analyses allow researchers to provide rich description and to focus on themes, patterns and processes that may not be evident in quantifiable data. This study describes the value to the government generated by FMS and also explores why and how this value is created (Yin, 2009, p. 3).

B. CASE SELECTION

The cases for this study were selected purposefully to yield information rich instances of the focal phenomena (Patton, 2002). This project's case selections are homogenous in terms of organization structure and practices but represent extremes in terms of Army FMS sales volume. This selection limits the influence of organization structure and practices, allowing influences associated with sales volume to be more observable. DSCA's online archived news releases were used to identify cases. DSCA's news releases represent the required notification of Congress of a likely FMS. These news releases include an estimated dollar figure, a weapon description, and known or anticipated prime vendors (by location). The news releases do not represent actual sales from foreign nations; however, they do represent a demand signal. Thus, the news releases thus signal demand trends and provide a reasonable basis for case selection.

We analyzed 378 Defense Security Cooperation Agency (DSCA) news releases addressed to Congress, issued from 2008 to 2015, to identify trends at the DOD level and

Army levels. In order to conduct the analysis, we assigned a service and a set of weapon categories (see Table 3) to each news release. Additionally, we associated each news release with a dollar figure and prime contractors.

Table 3. FMS Weapon System Categories

| Category # | MAJOR Weapon Systems Categories |
|------------|----------------------------------|
| | Aircraft |
| 1 | manned |
| 2 | unmanned |
| | Missiles/Bomb |
| 3 | aircraft delivery |
| 4 | ground delivery |
| 5 | C4ISR/Electronic Control Systems |
| 6 | Night Vision |
| 7 | Tanks and Tracked Vehicles |
| 8 | Wheeled Vehicles |
| 9 | Ammunition |
| 10 | Services |
| 11 | Weapon Systems |
| 12 | Ships |
| 13 | Military Construction |
| 14 | Other |
| 15 | FUEL |

Previous studies of FMS conducted by CBO, developed 10 weapon categories. Additional weapon categories have been added to reflect current systems; however, services were accounted for but not considered for case selection. The CBO's 1976 analysis demonstrated a minimal amount of cost savings or avoidance created by the sale of services. Our first level of analysis focused on the entire DOD FMS program. From April 2008 to May 2015, DSCA notified Congress of approximately \$292.6 trillion worth of expected FMS. The largest weapon category across this period was manned aircraft at \$141.76 billion; conversely, the smallest was night vision at \$330 million. Figure 8 depicts each weapon category as a percentage of total DOD FMS demand from April 2008 to May 2015, and Table 4 summarizes the potential sales volume by weapon category created by the demand for the same time period.

Figure 8. DOD FMS Weapon System Demand Trend as Percent of Total FMS Demand 2008–2015

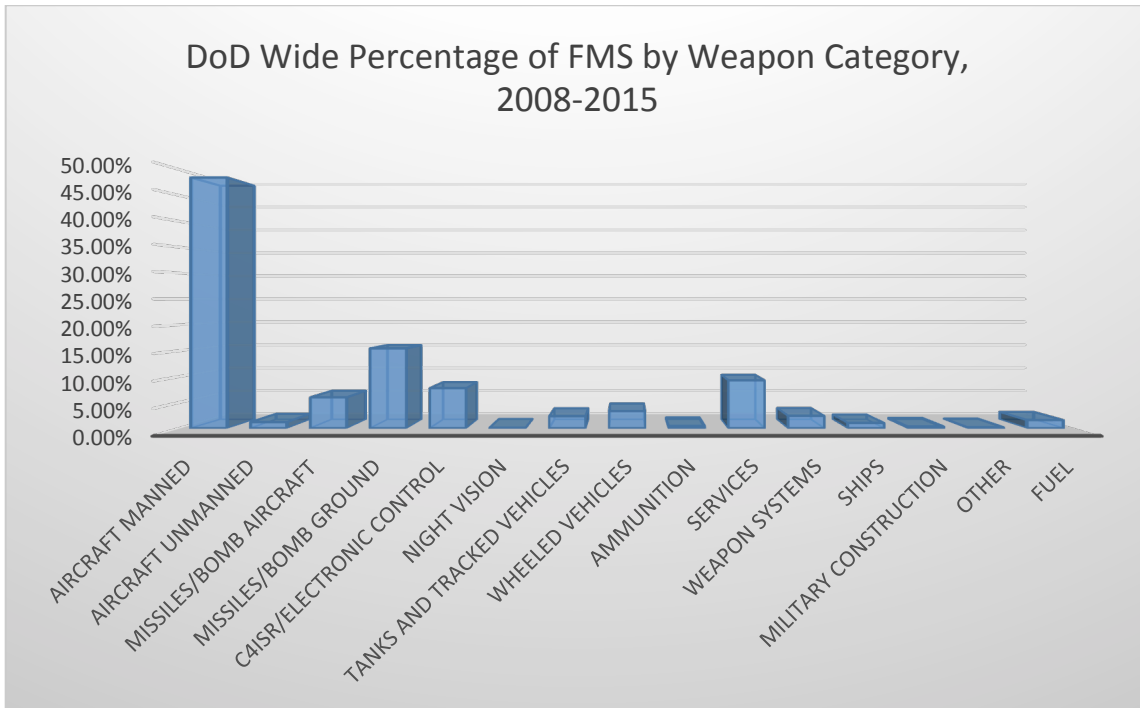


Table 4. DOD Total Potential Sales Volume by Major Weapon System Categories, April 2008 to May 2015 (in Millions)

| Category # | MAJOR Weapon Systems Category | Total | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|------------|----------------------------------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1 | Aircraft manned | \$141,763 | \$2,172 | \$13,347 | \$59,691 | \$11,188 | \$21,942 | \$16,124 | \$9,816 | \$7,483 |
| 2 | Aircraft unmanned | \$3,525 | \$205 | \$63 | \$218 | \$0 | \$1,200 | \$1,500 | \$0 | \$339 |
| 3 | Missiles/Bomb aircraft delivery | \$17,503 | \$980 | \$1,615 | \$602 | \$1,534 | \$1,574 | \$5,930 | \$2,639 | \$2,629 |
| 4 | Missiles/Bomb ground delivery | \$45,205 | \$319 | \$9,185 | \$4,276 | \$493 | \$22,535 | \$4,095 | \$4,110 | \$192 |
| 5 | C4ISR/Electronic Control Systems | \$22,722 | \$3,341 | \$2,880 | \$2,000 | \$2,312 | \$996 | \$75,730 | \$3,490 | \$130 |
| 6 | Night Vision | \$330 | \$0 | \$0 | \$0 | \$330 | \$0 | \$0 | \$0 | \$0 |
| 7 | Tanks and Tracked Vehicles | \$6,875 | \$2,160 | \$275 | \$0 | \$1,329 | \$0 | \$0 | \$2,641 | \$470 |
| 8 | Wheeled Vehicles | \$9,737 | \$4,100 | \$0 | \$122 | \$646 | \$233 | \$900 | \$3,736 | \$0 |
| 9 | Ammunition | \$1,294 | \$127 | \$0 | \$36 | \$820 | \$0 | \$54 | \$600 | \$395 |
| 10 | Services | \$27,147 | \$383 | \$2,785 | \$2,439 | \$4,769 | \$3,272 | \$7,638 | \$3,990 | \$1,871 |
| 11 | Weapon Systems | \$7,046 | \$510 | \$0 | \$966 | \$2,357 | \$538 | \$968 | \$140 | \$310 |
| 12 | Ships | \$3,066 | \$1,010 | \$321 | \$105 | \$0 | \$0 | \$1,200 | \$350 | \$80 |
| 13 | Military Construction | \$1,060 | \$0 | \$1,060 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| 14 | Other | \$610 | \$0 | \$75 | \$0 | \$200 | \$300 | \$35 | \$0 | \$0 |
| 15 | FUEL | \$4,670 | \$0 | \$0 | \$2,000 | \$0 | \$0 | \$2,670 | \$0 | \$0 |
| | TOTAL | \$292,553 | \$15,307 | \$31,606 | \$72,455 | \$25,240 | \$52,590 | \$48,687 | \$32,769 | \$13,899 |

Our second level of analysis focused only on the Army FMS program. In total, from January 2008 to May 2015, the DSCA notified Congress of \$150.7 trillion worth of expected Army-related FMS. The largest weapon category across this period was manned

aircraft at \$68.8 trillion; conversely, the smallest was unmanned aircraft at \$218 million. The unmanned aircraft system provides a more homogenous case to compare with Manned Aircraft. This homogeneity is caused by both weapon systems belonging to the same Army Program Executive Office (PEO) Aviation. Figure 10 depicts each weapon category as percentage of total Army FMS demand from 2008 to 2015 and Table 5 summarizes the potential sales volume by weapon category created by the demand for the same time period.

Figure 9. Army FMS Weapon System Demand Trend as Percent of Total FMS Demand 2008–2015

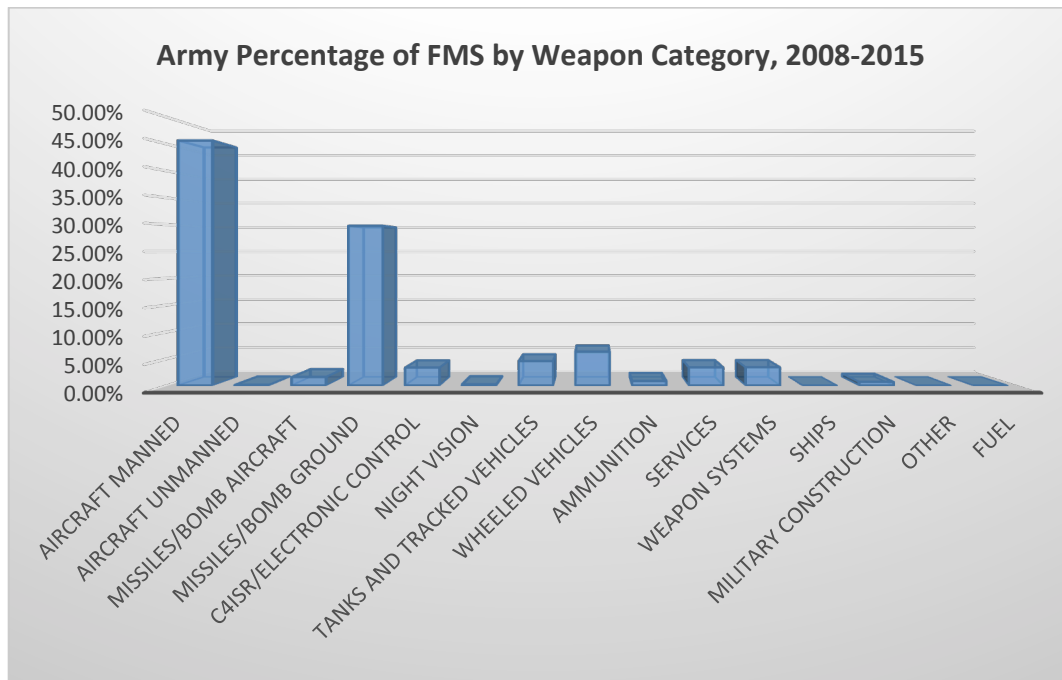


Table 5. Total Army, FMS-Based Demand Dollar Figures from DSCA
April 2008 to May 2015 Archives (in Millions)

| Category # | MAJOR Weapon Systems Category | Total | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|------------|----------------------------------|------------------|----------------|-----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|
| 1 | Aircraft manned | \$68,837 | \$144 | \$6,465 | \$42,091 | \$217 | \$9,430 | \$665 | \$5,944 | \$2,583 |
| 2 | Aircraft unmanned | \$218 | \$0 | \$0 | \$218 | \$0 | \$0 | \$0 | \$0 | \$0 |
| 3 | Missiles/Bomb aircraft delivery | \$2,418 | \$0 | \$577 | \$0 | \$65 | \$186 | \$0 | \$1,452 | \$138 |
| 4 | Missiles/Bomb ground delivery | \$44,876 | \$319 | \$9,040 | \$4,160 | \$443 | \$22,517 | \$4,095 | \$4,110 | \$192 |
| 5 | C4ISR/Electronic Control Systems | \$5,055 | \$485 | \$560 | \$841 | \$433 | \$428 | \$2,218 | \$90 | \$0 |
| 6 | Night Vision | \$330 | \$0 | \$0 | \$0 | \$330 | \$0 | \$0 | \$0 | \$0 |
| 7 | Tanks and Tracked Vehicles | \$6,875 | \$2,160 | \$275 | \$0 | \$1,329 | \$0 | \$0 | \$2,641 | \$470 |
| 8 | Wheeled Vehicles | \$9,504 | \$4,100 | \$0 | \$122 | \$646 | \$0 | \$900 | \$3,736 | \$0 |
| 9 | Ammunition | \$1,294 | \$127 | \$0 | \$36 | \$82 | \$0 | \$54 | \$600 | \$395 |
| 10 | Services | \$5,110 | \$0 | \$410 | \$538 | \$120 | \$1,770 | \$840 | \$1,432 | \$0 |
| 11 | Weapon Systems | \$5,146 | \$510 | \$0 | \$647 | \$2,134 | \$0 | \$885 | \$970 | \$0 |
| 12 | Ships | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| 13 | Military Construction | \$1,060 | \$0 | \$1,060 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| 14 | Other | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| 15 | FUEL | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 |
| | TOTAL | \$150,723 | \$9,143 | \$18,387 | \$48,653 | \$5,799 | \$34,331 | \$9,657 | \$20,975 | \$3,778 |

Based on an analysis of DSCA’s archival information, we selected the Army’s AH-64 Apache Helicopter to represent the high case and the Army’s RQ-7B TUAS Shadow to represent the low case for this comparative case study.

C. DATA SOURCES AND DATA

This study relied on a variety of both qualitative and quantitative data. Data was collected using in-person interviews, telephone interviews, an industry site visit, publication searches, Internet searches, and through direct support and interaction with program offices in the U.S. Army PEO Aviation. We conducted eleven interviews with government and industry leaders at the executive level. Government officials ranged from GS-13 to Lieutenant General (RET). Interviews typically lasted between 45 and 60 minutes. We conducted electronic database searches to collect historical documents from the GAO, CBO, and past student MBA projects related to FMS. We used the DSCA’s online archive to find documents describing the FMS process and historical news release documents indicating a potential sale to another nation. These collection efforts and data sources are summarized in Table 6.

Table 6. FMS Project DATA Summary Table

| Type | Name | File | Quantity/Unit |
|------------------------|---|---|-------------------------|
| Telephone Interviews | International Product Director, FMS Apache | recording | 64 minutes |
| | DASA (DEC) Director of FMS Policy, Strategy, and Resources | notes | 90 minutes |
| | USASAC PAO | notes | 15 minutes |
| | PEO Aviation, Deputy | notes | 20 minutes |
| | PEO Aviation, International Rep | notes | 35 minutes |
| Interviews/Site Visits | Product Director, FMS Shadow (14SEP15) | notes | 10 pgs |
| | Product Director, FMS Apache (15SEP15) | notes | 15 pgs |
| | LTG (Ret) Former Army MILDEP for ASAALT | notes | 90 minutes |
| | Boeing Executives @ Boeing Apache Plant (Mesa, AZ) | notes | 75 minutes |
| | DCMA Reps @ Boeing Apache Plant (Mesa, AZ) | notes | 3 hours |
| | Strategic Contracting Professor at NPS | notes | 60 minutes |
| Published Documents | DSCA News Releases 2008-May 2015 | Downloaded individual PDF documents | 378 docs avg 2 pgs each |
| | GAO articles | | |
| | Foreign Military Sales Program Needs Better Controls for Exported Items and Information for Budget Authority for Foreign Military Sales is Substantially Understated | Downloaded individual PDF documents | 39 pgs |
| | Changes Needed to Correct Weaknesses in End-Use Monitoring Program | Downloaded individual PDF documents | 15 pgs |
| | DOD's Stabilized Rate Can Recover Full Cost | Downloaded individual PDF documents | 30 pgs |
| | Millions of Dollars of Nonrecurring Research and Development Costs Have Not Been Recovered | Downloaded individual PDF documents | 20 pgs |
| | Improved Army Controls Could Prevent Unauthorized Shipments of Classified Spare Parts and Items Containing Military Technology to Trade Offsets in Foreign Military Sales | Downloaded individual PDF documents | 21 pgs |
| | CBO articles | | |
| | BUDGETARY COST SAVINGS TO THE DEPARTMENT OF DEFENSE RESULTING FROM FOREIGN MILITARY SALES | Downloaded individual PDF documents | 26 pgs |
| | FOREIGN MILITARY SALES AND U.S. WEAPONS COSTS | Downloaded individual PDF documents | 30 pgs |
| | Congressional Research Service Reports | | |
| | U.S. Arms Sales: Agreements with and Deliveries to Major Clients, 2004-2011 | Downloaded individual PDF documents | 31 pgs |
| | U.S. Defense Articles and Services Supplied to Foreign Recipients: Restrictions on Their Use | Downloaded individual PDF documents | 23 pgs |
| | DISAM Publications | | |
| | THE MANAGEMENT OF SECURITY COOPERATION | Downloaded individual PDF documents | 9 pgs |
| | DSCA SAMM | | |
| | Chapter 1 Security Cooperation Overview and Related | Downloaded individual PDF documents | 10 pgs |
| | Chapter 4 Foreign Military Sales Program General Information | Downloaded individual PDF documents | 17 pgs |
| | CAPS Research Report | | |
| | DEFINING COST REDUCTION AND COST AVOIDANCE | Downloaded individual PDF documents | 21 pgs |
| | USASAC News Releases | | |
| | Growing Foreign Sales Builds Partnerships | Downloaded individual PDF documents | 5 pgs |
| | Record first quarter for foreign military sales | Downloaded individual PDF documents | 1 pg |
| | USASAC closes out busiest year in 49-year history | Downloaded individual PDF documents | 2 pgs |
| | Army Sees Rising Global Demand for Helicopters, Missiles | Downloaded individual PDF documents | 4 pgs |
| | Foreign military sales growth area for Army | Downloaded individual PDF documents | 2 pgs |
| Working Documents | | Outlook Docs | 6 pgs |
| | International Apache Common Configuration | Powerpoint Brief | 9 pgs |
| | Executive Summary Boeing Mesa Apache Plant Visit | Word Document | 2 pgs |
| | Shadow FMS Product Director's Office Org Chart | Powerpoint Brief | 1 pgs |
| | Shadow System Historical Data | Powerpoint Brief | 1 pgs |
| | AUSA Focus Forum USASAC | Powerpoint Brief | 20 pgs |
| | DISAM FMS Process | Powerpoint Brief | 85 pgs |
| | USASAC STRATCOM | Powerpoint Brief | 12 pgs |
| Websites | | | |
| | Defense Security Cooperation Agency | http://www.dsca.mil/ | |
| | US Army Security Assistance Command | http://www.army.mil/info/organization/usasac/ | |
| | Boeing Helicopters | http://www.boeing.com/history/products/ah-64-apache.page | |
| | US Army PEO Aviation | http://www.army.mil/PEOAviation | |
| | Army Financial Management | http://www.asafm.army.mil/Default.aspx | |
| | Federal Acquisition Regulation (FAR) | http://farsite.hill.af.mil/VFFARA.HTM | |
| | Management and Accounting Website | http://maaw.info/ | |
| | Prentice Hall | http://wps.prenhall.com | |
| | Defense Acquisition University (DAU) | http://www.dau.mil/default.aspx | |
| | Defense Institute of Security Assistance Management (DISAM) | http://www.disam.dsca.mil/ | |

D. ANALYSIS APPROACH

We began our analysis by conducting a review of available historical data. This focused initially on GAO reports, CBO reports, and past Naval Postgraduate School MBA projects. Based on the historical research, we added public value as an element of FMS. The majority of the historical documents discussed FMS primarily in accounting terms, but did not mention the less tangible benefits associated with public value that FMS creates.

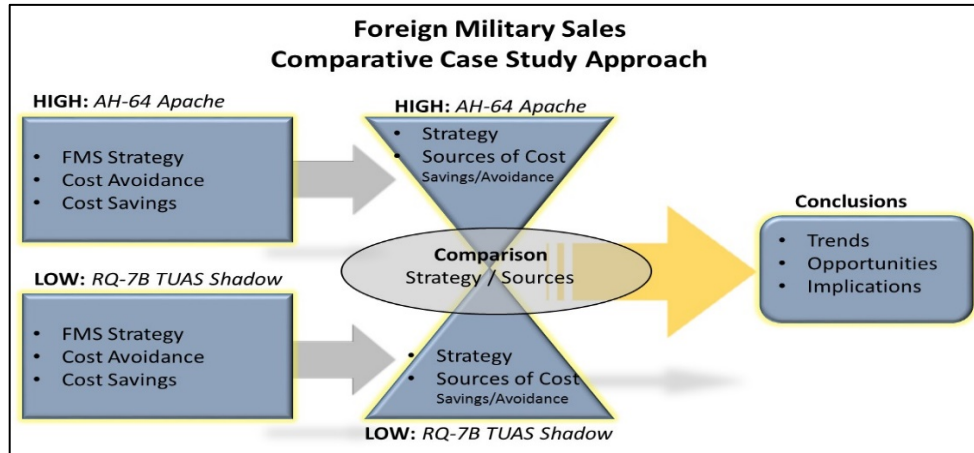
We next attempted to verify trends in FMS analysis conducted by the CBO in the early 1970s. To do this, we used similar weapon categories and added categories to reflect the nearly 40 years of technological growth. Using DSCA's archived data from April 2008 to May 2015, we analyzed FMS demand trends. The trends indicated which states likely received the most benefit from FMS, which weapon categories were likely to have the largest and smallest sales volume, and which companies were associated with FMS and to what extent. These trends allowed us to determine our high and low cases for comparison.

We conducted a within and between case analysis (Eisenhardt, 1989). We focused initially on each individual case to determine the program's strategy related to FMS, determining the sources of cost savings and cost avoidance and then analyzing the strategy's effect on those sources. After analyzing within each case, we then compared between the cases. The comparison focused on the similarities and dissimilarities between the two program's FMS strategies. We identified trends, opportunities, and implications that may exist when future FMS cases are considered and developed an initial framework, depicted in Figure 10.

As is typical of qualitative analysis, we then iterated between our initial model, the data and literature to further refine the model and identify recommendations (Eisenhardt, 1989; Yin, 1994). The initial framework suggested the importance of the role played by program strategy in trends and opportunities. We focused subsequent investigation on identifying sources of cost savings and cost avoidance and analyzing the

effect of the program’s FMS strategy on the sources. We describe the initial framework and present and describe the elaborated model in subsequent sections of this paper.

Figure 10. Foreign Military Sales Comparative Case Study Approach



In order to analyze each program’s strategy, we used qualitative data collection methods such as interviews and examining working documents. Determining sources of cost savings and cost avoidance was more of a blended effort between qualitative and quantitative methods. Collectively the data was used to determine sources of cost savings and cost avoidance and analyze the effect the program’s FMS strategy had on the sources.

IV. ANALYSIS AND FINDINGS

We conducted a between and within case analysis. Our analysis shows that FMS continues to be a strategic tool for the United States Government to equip our international partners and protect US interests around the globe. Our analysis identified four key sources of cost savings and cost avoidance: economies of scale, sustainment, production line gap, and international cooperative partners. We find that FMS cases generally increase public value based on the net outcome of all cost avoidance, government cost savings, and industry profit associated with each case. We find that in FMS case execution, programs are limited by quantity uncertainties and contractual limitations created by case timing and are limited in their ability to implement deliberate business strategies. The specific evidence for each source of cost savings and cost avoidance is not publicly releasable due to security and proprietary concerns. In order to demonstrate the nature of these sources, the program data is converted either into percentages or averages. This protects the companies and countries involved, while presenting evidence for particular claims. Chapter IV is divided into three sections. The first section describes each case and analyzes the sources of cost savings and cost avoidances. The second section compares the two cases and articulates findings. Finally, the third section illustrates an enfolding analysis and related findings.

A. CASE DESCRIPTION AND ANALYSIS

Our within case analysis describes the strategy and sources of cost savings and costs avoidance in both the Shadow and Apache programs. These programs represent the low and high cases in the study based on dollar values from congressional notifications. This provides a purposeful selection of data to facilitate generalizations in findings. This analysis identifies sources of cost savings and cost avoidance for each program created by FMS cases.

1. Shadow

The Shadow is an unmanned aerial vehicle (UAV) utilized in operational theaters as an intelligence, surveillance, and reconnaissance (ISR) asset. The Shadow is produced

by AAI Corporation and is operated by both the U.S. Army and the Marine Corp. Since 2000, AAI has produced more than 100 Shadow systems that have flown over 750,000 mission hours in Iraq and Afghanistan. The Shadow represents the low example in our case study with only two systems sold to one foreign partner. It will be analyzed based on its FMS strategy and sources of cost savings and cost avoidance.

The Program Manager for Tactical Unmanned Aircraft Systems (UAS) characterizes the program's FMS strategy as execution based. This suggests that the program does not incorporate FMS into production planning, because of the small volume of external sales. This limited business strategy is demonstrated by a single foreign customer and no anticipated foreign customers to benefit the program. The customer requested two Shadows that had already been produced by AAI Corporation. The USG was able to sell the two systems at cost. Currently, a technology restriction is in place as part of the U.S. security strategy, which dictates what countries can purchase the Shadow systems. The program office's ability to anticipate future sanctioned sales is constrained based on a limited awareness of the security cooperation strategy. This directly affects their ability to capture value from FMS and to build a comprehensive strategy that leads to cost savings and cost avoidance.

The Shadow's FMS sales are currently 1.6% of the total units in operation and accounts for the same savings in sustainment costs. The FMS customer pays a proportionate amount of the total PBL costs along with the Marine Corps (11%) and the Army (87.4%). This payment represent cost savings to the government because the Army's portion of the PBL contract would increase to 89% of the total PBL costs if those units had not been sold. The savings may seem low in percentage value, but over the life of the system attribute to significant cost savings.

The Shadow program has not dealt with production line gap problems in the past, but is foreseeing one in the future. The last new Shadow was built in 2011 and since then, the production line's capacity has been used to upgrade the Shadow from version 1 to version 2. The current plan is to complete upgrades by 2019, but the replacement for the Shadow does not meet its initial operational capabilities (IOC) until 2028. The program will attempt to leverage FMS to fill the nine year gap between products. This would lead

to cost avoidance by preventing the USG from paying initial startup and associated learning costs.

As the low case in this study, Shadow realizes cost savings through its PBL strategy and may attain cost avoidances in the future by ensuring the production line stays open. The program office accomplishes this through an execution based strategy that leverages the additional system's maintenance requirements to capture value for the USG. Government captured value may not be a large percentage of the overall cost, but represents large savings over the total life of the program.

2. Apache Attack Helicopter

The Apache helicopter is the U.S. Army's primary attack helicopter and represents our high case in the case study. The Apache program has sold hundreds of helicopters to more than five different countries and is one of the largest manned aircraft programs that participates in FMS. This program is analyzed based on its FMS strategy and sources of cost savings and cost avoidances.

Apache's FMS strategy can be characterized as opportunity-based. This strategy facilitates partnerships and cooperation among its foreign partners and is evident in the approximately 15 current cooperative projects. The Apache program also seeks to leverage the increased volume of FMS to provide value to the government at each stage of the acquisition life cycle. Currently, Apache attempts to gain flexibility on production contracts but does not possess the ability to predict accurate demand quantities. This forces the Apache program to be reactionary in gaining savings for the government in terms of production and sustainment. A large part of Apache's strategy is capitalizing on foreign partner support for technology early in the acquisition process. This allows the program to capture value by developing technology and providing commonality and interoperability for our allied partners in the future.

The Apache program office leverages FMS through economies of scale, sustainment functions, production line gap, and cooperative developments. Economies of scale is possible through Apache FMS because of the substantial increased volume in sales. Cost savings and cost avoidances overlap in this instance but are seen through

learning rates, re-allocation of overhead and common labor as well as reduction in direct material costs.

The Apache production office uses the additional quantities from FMS to increase cost savings associated with learning and experience. The learning curve rate on the Model E is 90%. This suggests that every time the production quantity doubles, the labor hours decrease by 10%. The learning rates have a definite effect on direct labor cost through labor and process efficiencies. Apache realizes the most cost savings at the beginning of the production timeline, but also uses these rates for a modest effect at the end of the production period. The first 60 Model E aircraft were purchased by FMS customers, prior to the USG purchasing eight. On average, this saved the government 5816 labor hours per aircraft. According to Boeing's public website, the average aircraft/plant mechanic makes \$25 an hour. Thus, the USG saved an estimated \$1.16 million on the first eight aircrafts it produced. Over the total production of the Model E Apache, the USG realized a 31% or \$2.2 million cost savings from direct labor.

Cost savings and avoidances are also realized through the re-allocation of overhead and common labor costs. A re-opener clause in the Apache contract clause allows the government to capture these costs for the benefit of the government through the Defense Contracting Audit Agency (DCAA). Overhead rates that are negotiated through the contracting process are based on a certain volume of production. If production volume changes and the government has a re-opener clause, the government can renegotiate rates based on the new production volume. This is also true for common labor pools. Large government contractors have employees that work on multiple contracts. If production volume increase, the government, through the re-opener clause, can re-allocate those cost to account for FMS.

The increased quantity of sales from FMS allow the government to take advantage of economic order quantities (EOQ). This is done through contractor direct materials and government furnished equipment (GFE). Capturing cost savings from the contractor on direct material is relatively the same as described in the previous section. This must be done through a re-opener clause in the production contract by DCAA. DCAA has reopened the contract and negotiated economic order quantity discounts

taking into account the increase in sales. The government also seeks EOQ discounts from government vendors that provide GFE as part of the aircraft build. The new sales allow the government to purchase components at a cheaper rate adding to the increase in cost savings. .

Additional sources of cost savings and avoidance for the Apache program are captured through the program's logistics strategy. A combined logistics strategy allows the program to leverage increased volumes of common spare parts as well experience. This decreases the overall sustainment cost for the USG and increases the availability of spare parts. The Apache program uses its Model D and Model E aircrafts to develop "common configuration" upgrades. These upgrades remove variations in the aircrafts and produces efficiencies for both hardware and software maintenance. For example, in the previous versions of the Apache, international customers had different software and hardware packages. This made the sustainment system more complex and expensive to maintain. By reducing variability and increasing standardization in the programs, Apache has experience increased cost savings and cost avoidances.

Over the history of the Apache program, FMS has kept the production line open twice. These two occurrences represent enormous cost avoidances to the government. If Apache did not have FMS customers, Boeing would have shut down the production line. This would have a tremendous effect on the U.S. industrial base and would also force the USG to incur estimated average startup cost of \$35 million to resume production.

International partners allow the USG to build capabilities and improve technology at a fraction of the price. This is done through capability enhancement partnerships and International Cooperative Research, Development and Acquisition (ICRDA). The Apache program experiences cost savings through partnerships with FMS customers to develop and test new capabilities called technology insertion. These countries may desire new technology that is not funded, or they may want this capability sooner than what their budget allows. When this happens, the countries give the USG funds to develop and test this capability. The Apache office has saved approximately \$101.5 million on more than five projects that have increased the operational effectiveness of the Apache. The Apache program also has one ICRDA partner. This relationship is defined by a mutually

agreeable Memorandum of Understanding (MOU) and generates cost savings through R&D efficiencies and shared costs. By the end of 2016, the USG and its partner will have completed approximately fifteen projects to improve or augment the Apache program. These projects range from increased personnel safety to enhanced weapons capabilities. These foreign partnerships allow the USG to develop technology at a significant reduction in price and provide new capabilities to the operational force.

The Apache is one of the largest FMS products in the Army and realizes cost savings and cost avoidance in multiple areas across the acquisition life cycle. Cooperative projects and economies of scale together create the largest volume of cost savings. Cost avoidance is difficult to estimate, but the sources of cost avoidances are through a combined logistics strategy, common configuration, and production line gaps. Overall, the Apache program, through its opportunity-based FMS strategy has captured significant value for the USG.

B. COMPARATIVE ANALYSIS AND FINDINGS

1. Analysis

FMS strategies for the Shadow and Apache are extremely different in terms of planning and execution. Since Shadow only has one customer, their strategy is to execute as effectively as possible without deliberately planning to generate any value to the government. In comparison, the Apache has multiple customers and uses increased volume sales to generate considerable value to the government. They do this through contracting mechanisms (re-opener clause) and capability enhancement partnerships. Both programs are hampered by the lack of ability to anticipate future demand and are constrained by contractual limitations based on case timing. The Apache program has attempted to create some flexibility using their contracting strategy to capture more value from FMS.

The Apache program captures substantially more value in the form of cost savings and cost avoidances than the Shadow program. Currently, Shadow demonstrates only one source of cost savings, whereas Apache exhibits eight sources of cost savings and cost avoidances. Both programs experience savings in sustainment, but Shadow realizes little

savings through PBL in comparison to Apaches mixed logistics approach and common configuration upgrades. Production line gap is a consideration for both programs. This was a reality for Apache in the past, while Shadow is preparing for it in the future. The Apache and Shadow continue to operate in exceedingly different environment while seeking to supply their individual products as efficiently and effectively as possible to their foreign partners.

Common to both cases was an inability to characterize the total value created by an FMS case. The values in both cost avoidance and cost savings were estimated without direct access to industry profit or overhead figures. Based on contractual relationships industry partners in both programs were not obligated to share overhead rates or specific profit information based on proprietary rights. Therefore, a determination of the total value created by an FMS case is unknown making it difficult to determine how much of the value is actually captured by government versus industry.

2. Findings

The within and between case analyses of the Apache and Shadow programs illustrate the depth of opportunity created by FMS. Though the total value created through FMS may not be entirely clear, the analysis shows that increased cost savings and cost avoidances are captured by the USG. We used the comparative case study approach model, developed in the literature review, to identify three groups of findings: sources of cost savings and cost avoidance, public value framework and findings from enfolding analysis.

a. Sources of Cost Savings and Costs Avoidance

Three categories of cost savings and cost avoidance are evident from our analysis: economies of scale, sustainment and international cooperative programs as shown in Figure 11. Cost savings are realized savings that, potentially, can be reinvested, while cost avoidances are decisions made now that reduce cost expenditures in the future. These sources of cost savings and cost avoidance are only captured through intentional planning during the early phases of the acquisition life cycle.

Figure 11. Sources of Cost Avoidance and Savings

US Government Sources of FMS Cost Savings and Cost Avoidance

How are Cost Savings and Cost Avoidance Different?

Cost Savings- An action that will result in a smaller-than-projected level of costs to achieve a specific objective. E.g Average Unit Cost- Theoretically, savings to be re-invested

Cost Avoidance - An action taken in the immediate time frame that will decrease costs in the future. e.g MTBF Decision or Production Line Gap

Sources

Economies of Scale

- Learning Curve- Direct Labor
- Overhead and Common Labor
- Direct Material (EOQ)

Sustainment

- Performance Based Logistics
- Common Block Upgrades
- Production Line Gap

International Cooperative Programs

- Capability Enhancement
- International Cooperative Research, Development and Acquisition (MOU)

(i) Economies of Scale

The added volume of sales in the Apache program led to cost savings through learning curve rates, overhead or common labor, and direct materials. The Apache production contract reopener clauses allowed the government to renegotiate rates and recoup savings. The Shadow program did not experience economies of scale due to the limited number of systems sold to their foreign partner. The research determined that the Apache program's learning curve rate is 90% and is approximately \$2.2 million in cost savings to the government. Apache airframes sold at the beginning of a production contract created more savings than those sold towards the end of the contract, resulting in the first eight apaches realizing 53% of the total savings. Overhead and common labor pools saw savings through reallocation over a larger product volume, while direct material costs were reduced through an EOQ.

(ii) Sustainment

Sustainment provides both cost savings and cost avoidances to the government. PBL saves costs for the Shadow in a limited capacity of 1.6% of total PBL expenditures. Apache leverages more sustainment opportunities through increased volume of sales and common spare parts. Costs are avoided through common configuration upgrades in hardware and software, allowing the USG to avoid future maintenance costs. The common configuration upgrades not only lower sustainment costs in the future, but

increase overall availability and reliability of the system. Production line gap was a main focus of both program managers. FMS has kept the production line open twice over the life cycle of the Apache saving on average \$35 million. Shadow is looking to FMS in the future to fill a production gap between the end of production of the Shadow and the new replacement UAV. Sustainment provides multiple sources of cost avoidances, but the values are difficult to calculate since they may occur in the future.

(iii) International Cooperative Programs

The analysis showed that creating international partners at the beginning of the acquisition process leads to cost savings. Apache experienced over \$101.5 million in savings through both the ICRDA program and capability enhancement partnerships. Apache has one ICRDA partner that co-developed approximately ten product improvements and has plans for more. They also have approximately five partners that developed unfunded requirements resulting in product improvement at a reduced cost to the government.

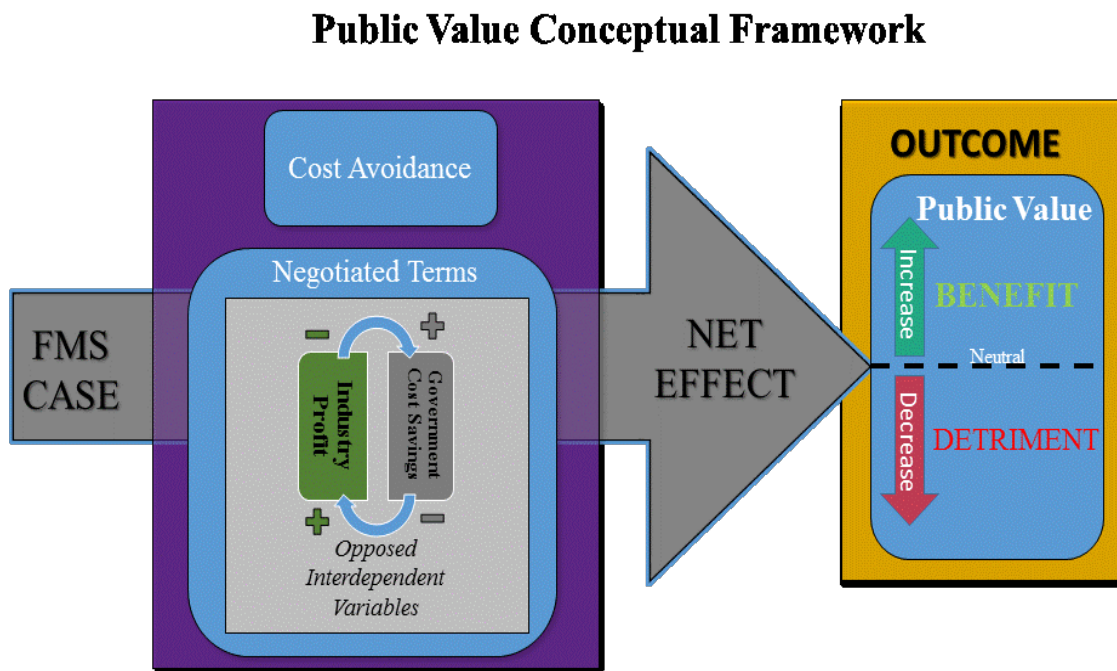
b. FMS Public Value Conceptual Framework

Figure 12 represents a conceptual framework developed by this project through the observation and comparison of both a high and low FMS case study. In both cases, cost avoidance was a topic that both industry and government personnel were comfortable openly describing but were generally only able to provide rough estimates. Conversely, cost savings proved more difficult to gain access to raw data. Through interviews and open source documents we were able to identify actual sources of cost savings but were limited in gaining raw data. We found the resistance to sharing actual cost savings data in itself a finding.

The actual cost savings achieved by an FMS case must be shared by some ratio between government and industry. The share ratio is determined by the timing of the FMS case and the current state of the government contract. The type of contract the government already has with the industry partner sets the parameters for who receives more value from the case. If the contract is a Firm Fixed Price contract and categorized as

a commercial item, industry legally does not have to reveal rate and pricing data. When many of the actual cost saving sources are considered industry proprietary information, the government is much less likely to gain cost savings value. However, regardless of whether industry captures more profit or government captures more savings the net outcome is an increase or benefit to public value. Based on these observations predicting potential government cost savings in an FMS case is most dependent on the case timing, the contractual relationship between government and industry, and based on these observations each program has a potentially unique outcome.

Figure 12. Public Value Conceptual Framework: Relating FMS Case Net Effects to Public Value



The framework shows the relationship FMS has with public value by modeling the process through which public value increases or decreases. The process begins with the initiation of an FMS case and the determination of cost avoidance and negotiated terms. The negotiated terms represent the outcome or attribution of the cost savings value to either industry profit, government cost savings, or some combination of both. This framework depicts the opposing, interdependent nature of industry profit and government

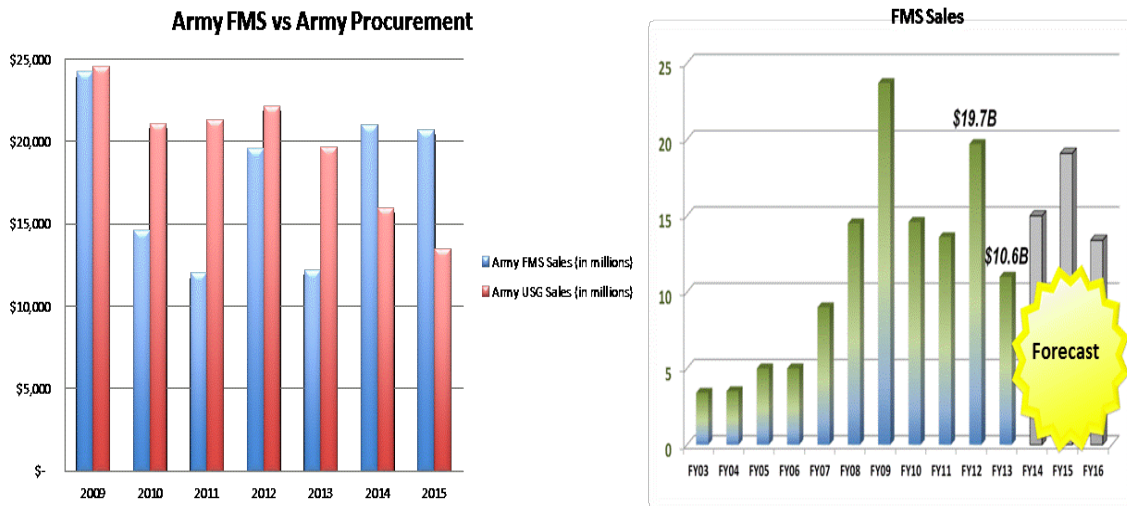
cost savings. The framework suggests that the outcome of the negotiated terms should be measured as an absolute value. The combination of cost avoidance and negotiated cost savings provides a net effect that serves to either increase or decrease public value.

c. Findings Resulting from Enfolding Analysis

(i) Army Procurement Spending Nearly Matched by Army FMS

In an effort to understand if more emphasis should be placed on a FMS business strategy, we conducted further research in the form of interviews with senior acquisition professionals and data mining for FMS sales and Army procurement figures. We found a significant upward trend in the growth of FMS sales volume. Starting in the 2007 time frame we found a significant growth in FMS sales volume that continued to grow nearly exponentially through 2009. This growth trend is most likely associated with shifting United States National Security Strategy and focus on security cooperation initiatives. As depicted in Figure 13, the growth trend appeared to decline and stabilize post 2009; however, when Army FMS sales are compared to Army procurements from 2008 to 2015 another trend emerged. In every year Army FMS sales matched at least 50% of Army procurements. This growth represents a significant volume of sales that does not have a synchronized business strategy.

Figure 13. Army Procurement Spending Compared to FMS



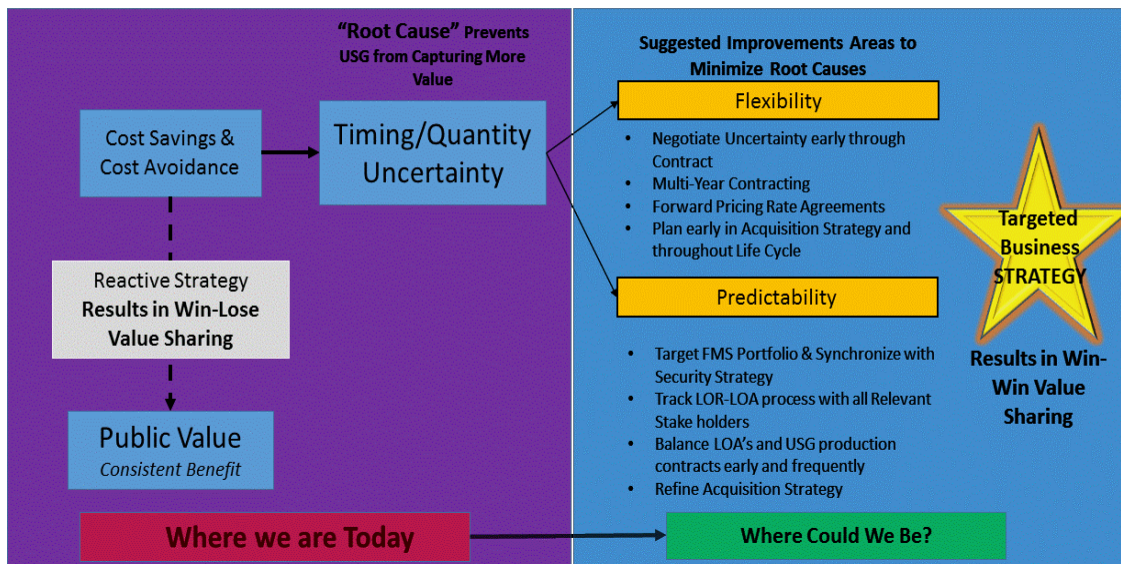
(ii) Root Causes Contributing to Lack of Business Strategy

FMS is driven by the United States National Security Strategy and allied nation’s need for capability. Between the National Security Strategy and the U.S. allies’ capability gaps the demand for U.S. capabilities is generated. Therefore, the security strategy drives the demand for FMS. However, in interviews with senior acquisition professionals we discovered that at no point has there been a complementary business strategy to anticipate and take advantage of FMS through a coordinated effort. Specifically, we were not able to find instances in which all key U.S. stakeholders in the FMS process met for collaborative long range planning to synchronize both a security and business strategy.

In both cases no internally or externally developed deliberate business strategy emerged to synchronize FMS business with the overarching security strategy in order to maximize or anticipate value gaining opportunities for the government. Instead we found a more reactive or opportunity-based approach in both cases. Common to both cases was a considerable amount of uncertainty in timing and quantity associated with FMS cases. These uncertainties generally create a win-lose result in the industry and government negotiated terms for cost savings value sharing. The uncertainty in timing stems from a lengthy FMS process that is difficult to both track and anticipate at the program level. Similarly, quantities associated with a FMS cases can fluctuate depending on economic circumstances abroad in the recipient nations. Figure 14 represents a depiction of the

current root causes preventing the government from gaining more value from FMS cases. In order to address these root causes and achieve more win-win negotiations with industry, flexibility and predictability should be considered across the FMS enterprise.

Figure 14. FMS Value Sharing Challenges and Root Causes



(iii) Policy Limitations and Regulatory Tools

a. Acquisition Policy, DOD 5000.02

As depicted in Figure 15, we found limited policy with respect to Acquisition Strategy and FMS. The DOD 5000.02 makes several short references to international sales in Enclosure 2, Program Management. In paragraph seven, it states a program manager’s strategy must have understanding of the opportunities in the international markets. In paragraph 10, it indicates that program management is responsible to integrate international acquisition. Outside of these two paragraphs we found no policy indicating how DOD would synchronize a security strategy with a business strategy. Seemingly, the lack of linkage between the security strategy and limited acquisition policies maybe contributing significantly to the root causes preventing the government from gaining a larger share of the cost savings value.

Figure 15. DOD Acquisition Policy and Relationship to FMS

FMS and DoD Acquisition Policy

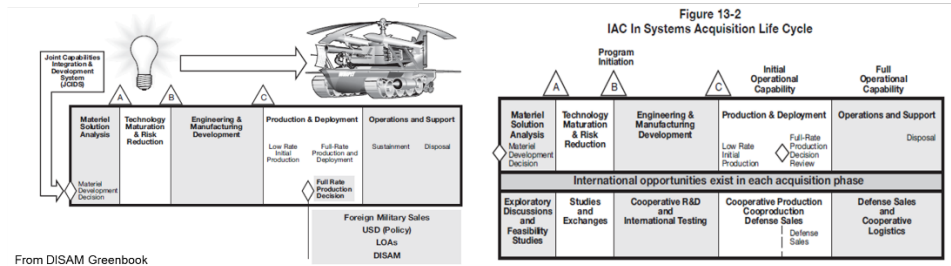
DoD 5000.02 (interim NOV 13)- Enclosure 2, Program Management

PAR. 7 ACQUISITION STRATEGY

a. Overview. PM's strategy must have understanding of... opportunities in the domestic and international markets;

PAR. 10 INTERNATIONAL ACQUISITION AND EXPORTABILITY

a. Program management is responsible for integrating international acquisition and exportability considerations into the program's Acquisition Strategy at each major milestone or decision point.



Adapted from: Grafton, J. S. (Ed.). (2015, June 1). *The management of security cooperation* (34th ed.). Wright-Patterson AFB, OH: Defense Institute for Security Assistance Management p. 13-3.

b. Potential FMS Tools in the Federal Acquisition Regulation

Findings from the comparative case study analysis indicate that one likely root cause preventing the government from gaining larger shares of the cost savings was timing. A program's ability to negotiate benefit from an FMS case depends on where the program is in the contracting process. If the program is not already committed to a contract they may be able to more effectively negotiate win-win terms in the value sharing. This drives a need to create flexibility in program production contracts that allows for price negotiation or breaks when new FMS volume is introduced.

Through interviews and researching the FAR we found two particular components of the FAR that could provide flexibility to incorporate FMS cases more effectively in government contracts. The first comes from FAR Part 15, the part regulating federal negotiated contracts. FAR subpart 15.407 covers special cost or pricing agreements and in 15.407-3 government contracting officers are given the authority to negotiate forward pricing rate agreements. With this provision and some basis of a demand forecast contracting officer and programs could potentially build step-pricing agreements based on FMS volume increases into contracts.

The second useful provision in the FAR come from FAR Part 17, which regulates special contracting methods. FAR subpart 17.1 covers multi-year contracting. Multi-year contracting exists to allow contracting officers the ability to lower costs by avoiding start up and shut down fees. When these two provisions are combined early in the contracting process they may provide means for program offices and contracting officers to build contracts with the flexibility necessary to gain value from FMS cases even in uncertain conditions.

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V. RECOMMENDATIONS AND IMPLICATIONS

We developed recommendations and implications as a result of our case analysis and findings. These recommendations focus on developing a conceptual framework that proposes an integrated FMS strategy. In our recommendation we describe some of the necessary relationships between the security and business strategies and propose predictability and flexibility as essential components of a targeted FMS business strategy. The lack of predictability associated with FMS and government cost savings implies a need for the government to more effectively describe the value of the FMS program. Our study highlights the need to address the FMS Narrative, consider updating or enforcing policy, determine which government organizations should directly benefit from re-investible cost savings, and assess how organizations can better fit to achieve a synchronized approach.

A. RECOMMENDATIONS

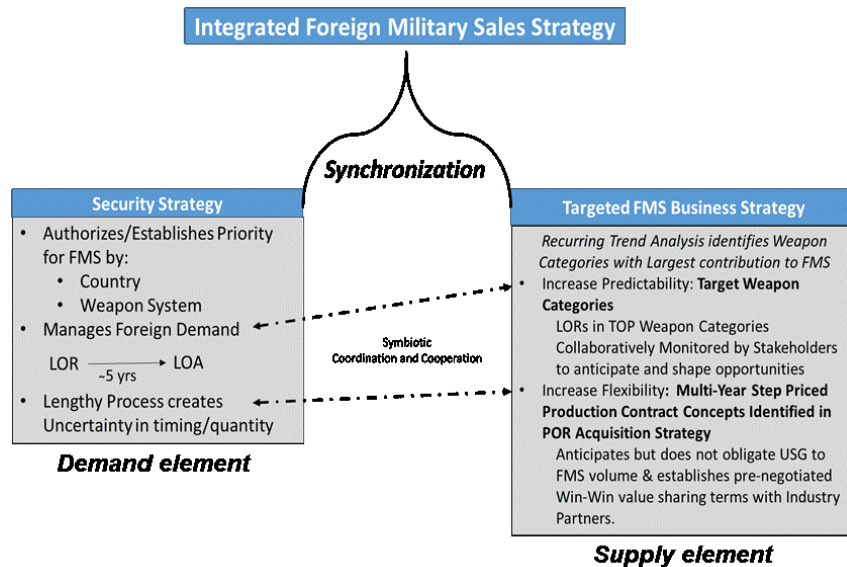
Our analysis and findings led us to develop recommendations to address potential methods to increase retained value for both the government and industry through the FMS process. Our recommendations focus on developing a conceptual framework that proposes an integrated FMS strategy. An integrated FMS strategy consists of both a targeted business strategy and a security strategy synchronized to develop a more predictable and efficient supply and demand relationship. An overarching targeted FMS business strategy should exist to complement the existing FMS security strategy. In our recommendation, we describe some of the necessary relationships between the security and business strategies and propose predictability and flexibility as essential components of a targeted FMS business strategy.

1. Integrated Foreign Military Sales Strategy

Figure 16 attempts to show at the macro level what elements might be required to develop an Integrated Foreign Military Sales Strategy. An Integrated Foreign Military Sales Strategy has three core elements: 1. Security Strategy, 2. Targeted FMS Business Strategy, and 3. Synchronization. From the findings we understand that the security

strategy seems to behave as the demand element of the FMS process. The security strategy behaves as the demand element because it regulates what can be sold to whom and orchestrates the majority of the FMS case process. Based on the growing and substantial volume of FMS sales, a targeted FMS business strategy should be developed to organize the supply element. The targeted FMS business strategy may provide a complementary balancing effort to the security strategy. The gain from the balancing effort could allow the government to capture more value in the FMS process and potentially increase opportunity and value for industry as well. The targeted business strategy should focus on isolating the most productive weapon categories and then work to bring predictability and flexibility to the process. The synchronization of these two strategies could be achieved through a variety of organizational and policy driven initiatives. This demand and supply relationship necessitates more of a symbiotic relationship to fully realize an integrated strategy.

Figure 16. Macro View of a Conceptual Integrated Foreign Military Sales Strategy

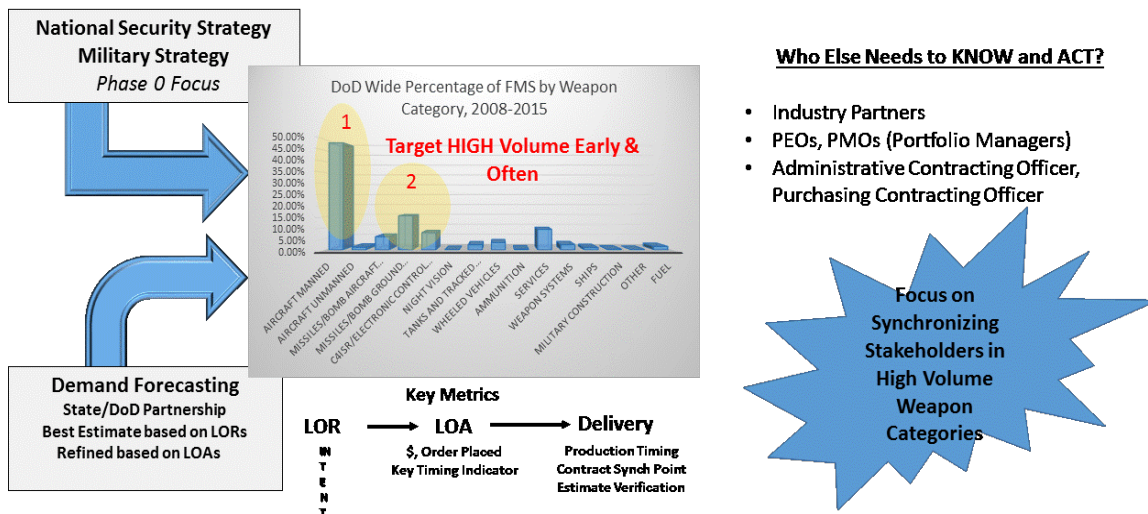


a. Predictability as Part of the Targeted FMS Business Strategy

In order to address the root causes of timing and quantity uncertainty in the FMS process, increasing predictability should be considered as a core component to a targeted

FMS business strategy. Developing predictive forecasts of the entire FMS portfolio would likely prove to be a costly effort. Narrowing the forecasting effort to the weapon categories with the highest volume of sales may save considerable resources and become a more manageable effort. Narrowing the forecasting effort may result in greater degree of accuracy and likely will foster a greater degree of coordination and collaboration between stakeholders. Figure 17 shows a potential process to synchronize stakeholders to achieve actionable predictability. The process starts with capturing historical demand for weapon categories and refining the demand profile periodically based on security strategy and demand forecasting to yield high volume FMS areas to focus on. Stakeholders in these targeted weapon categories should synchronize deliberately using key timing and quantity indicators or metrics in the FMS process such as: 1. Letter of Request, 2. Letter of Acceptance and 3. Agreed upon Delivery Schedule.

Figure 17. Creating Predictability in a Targeted FMS Business Strategy

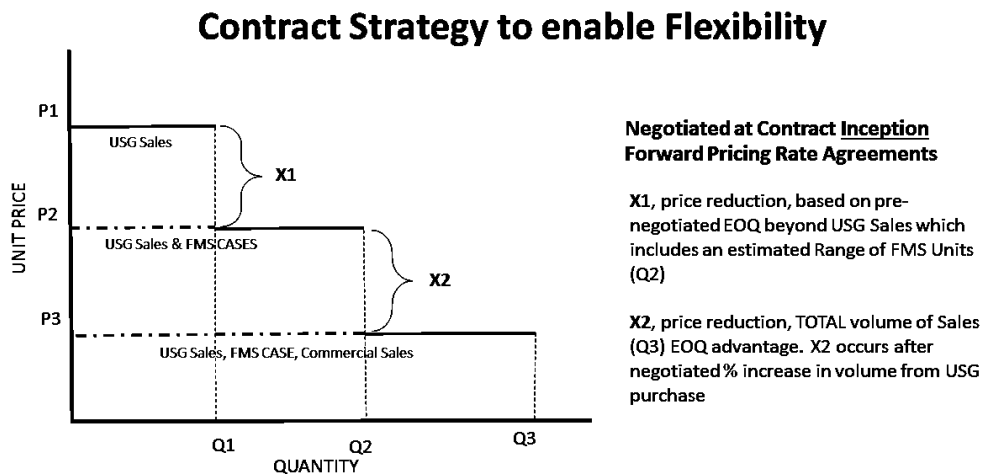


b. Flexibility as Part of the Targeted FMS Business Strategy

In order to address the root causes of timing and quantity uncertainty in the FMS process, increasing flexibility should be considered as a core component to a targeted FMS business strategy. In order to increase flexibility in a targeted FMS business

strategy, program acquisition strategies should place more emphasis on production contract structures. Figure 18, graphically depicts a concept to implement step-pricing early in production contracts. Incentivizing contractors with multi-year production contracts, authorized by FAR Part 17.1, may produce more favorable conditions to negotiate forward pricing rate agreements. Forward pricing rate agreements, authorized by FAR 15.407-3, when combined with a predictive or FMS forecast allow the contracting officer and contractor to negotiate potential price points based on anticipated economic order quantities. In Figure 18, X1 represents the step price reduction when FMS quantities are included, and X2 represents a further price reduction if total volume of sales is included in the step-pricing model. Ultimately, a multi-year contract with forward pricing rate agreements anticipates FMS volume & establishes pre-negotiated win-win value sharing terms with industry partners without fully committing the government.

Figure 18. Contracting to Create Flexibility in the Integrated FMS Business Strategy



2. Implications

In our study we have identified that the FMS process, strictly in an economic sense, generally increases public value. We also believe that a FMS case's ability to provide value to the government in the form of cost savings and cost avoidance is unique

to the current contractual relationship between government and industry. Each FMS case uniquely contributes to government cost savings and cost avoidance based on the weapon category, the state of production, and the existing contract. This uniqueness inherently makes estimating government cost savings and cost avoidance difficult to consistently predict. The lack of predictability associated with FMS and government cost savings implies a need for the government to more effectively describe the value of the FMS program. Our study highlights the need to address the FMS narrative, to consider updating or enforcing policy, to determine which government organizations should directly benefit from re-investible cost savings, and to assess how organizations can better fit to achieve a synchronized approach.

a. FMS Value Narrative

Using cost savings and cost avoidance as metrics to demonstrate the value of FMS is difficult and not likely to be consistent. In most cases this is caused by the natural tension between industry profit and government cost savings and by a negotiated outcome. Public value appears to be a more reliable metric to describe the full value creation of the FMS enterprise.

b. Policy to Implement a Synchronized Approach

The significant rise in FMS sales over the last six years is an important trend to monitor. The national security strategy continues to focus on security cooperation ensuring the increasing trend in FMS. Senior DOD policymakers should consider if language found in DOD 5000.02, Enclosure 2 is specific enough to favorably integrate FMS into government acquisition strategy? The policy already requires programs to update acquisition strategy and foreign sales potential at each milestone. However, the policy does not direct any coordinating requirements to drive organizational synchronization. This synchronization is essential to collectively arrive at a targeted FMS business strategy.

c. Cost Savings Implications to Budgeting and Programming

In order to gain more broad organizational awareness and commitment in creating government value from FMS cases, budgeting and programming issues need exploration. What happens when more government cost savings are realized through FMS? Is it a penalty or a benefit for the associated program? If program managers are able to effectively build in FMS and create savings in the production and contract efforts do they get to keep the savings? If savings are realized are program budgets necessarily reduce in future years?

d. Negotiating WIN-WIN FMS Solutions with Industry

Shaping potential future negotiations with industry partners to collaboratively structuring contracts in anticipation of FMS sales is a necessary step. The government needs to determine what incentives need to come with FMS negotiations in order to facilitate more value sharing. The incentives could include measures such as reducing case processing time.

e. Organizing to Support an Integrated FMS Strategy

The government needs to determine which DOD organizations are value added for synchronizing a Security and Business Strategy. They should specify how the liaison and leadership roles are defined across the duration of the FMS Case. The government needs to address whether these roles should change as the case matures and when the security strategy or business strategy should have priority.

VI. CONCLUSIONS

In 1976, the Congressional Budget Office conducted an analysis to determine cost savings resulting from foreign military sales (FMS) at the request of the House Armed Services Committee. This study analyzed 35 weapon systems across the Department of Defense (DOD) and noted that only 50% of FMS sales resulted in a cost savings to the United States. The FMS sales that generated savings did so at a rate of 14 cents of savings for every dollar of sales (Capra, Schafer, & Renehan, 1976, p. 17). The United States military industrial base and military programs have seen significant changes since 1976 warranting a current investigation of the FMS program's ability to generate economic value for U.S. taxpayers. The objective of this study is to address this need. This study develops a framework from which to analyze cost avoidance, cost savings, and public value and applies this framework to estimate the net benefit to the U.S. taxpayers.

Extant studies of the value of FMS make economic assumptions in regard to economies of scale. These reports do not go beyond the notion that increased production results in lower costs. However, research and practice suggest many alternative sources of value (e.g., learning curve, labor pools, common block upgrades). A deeper understanding of the broad spectrum of potential sources of value will allow the USG to better leverage increased global demand and capture added value for the taxpayer. A current and more complete understanding of actual cost savings and cost avoidances of FMS will benefit USG's entities—from the program office to the taxpayer—by allowing decision-makers to make more informed decisions and more fully capture value from the FMS program. This study identifies DOD and Army Foreign Military Sales demand trends, defines cost savings and cost avoidance, creates a framework from which to analyze the economic impacts of FMS and analyzes the barriers to leveraging FMS to generate cost savings and cost avoidances.

We conducted a comparative case analysis (Eisenhardt, 1989; Yin, 2009) using two organizations representing the upper and the lower limits of Army FMS volume. The comparative case study method is a well-suited research approach for this FMS project.

This study describes the value to the government generated by FMS and also explores why and how this value is created (Yin, 2009, p. 3). The cases for this study were selected purposefully to yield information rich instances of the focal phenomena (Patton, 2002). This selection limits the influence of organization structure and practices, allowing influences associated with sales volume to be more observable. DSCA's online archived news releases were used to identify cases. DSCA's news releases represent the required notification of Congress of a likely FMS. These news releases include an estimated dollar figure, a weapon description, and known or anticipated prime vendors (by location). The news releases do not represent actual sales from foreign nations; however, they do represent a demand signal. Based on an analysis of DSCA's archival information, we selected the Army's AH-64 Apache Helicopter to represent the high case and the Army's RQ-7B TUAS Shadow to represent the low case for this comparative case study.

We focused initially on each individual case to determine the program's strategy related to FMS, determining the sources of cost savings and cost avoidance, and then analyzing the strategy's effect on those sources. After analyzing within each case, we then compared between the cases. The comparison focused on the similarities and dissimilarities between the two strategy's sources. We identified trends, opportunities, and implications that may exist when future FMS cases are considered and developed an initial framework. We then iterated between our initial model, the data and literature to further refine the model and identify recommendations (Eisenhardt, 1989; Yin, 1994). The initial framework suggested the importance of the role played by program strategy in trends and opportunities. We focused our subsequent investigation on identifying sources of cost savings and cost avoidance and analyzing the effect of the program's FMS strategy on the sources.

The Apache and Shadow programs illustrate the depth of opportunity created by FMS. Though the total value created through FMS may not be entirely clear, the analysis shows increased cost savings and cost avoidances are captured by the USG. We identified key findings that included sources of cost savings and cost avoidance, a public value framework, Army procurement spending is nearly matched by Army FMS, and

determined uncertainty in order quantities and contractual limitations as root causes contributing to lack of FMS business strategy.

Three categories of cost savings and cost avoidance are evident from our analysis: economies of scale, sustainment and international cooperative programs. The actual cost savings achieved by an FMS case must be shared by some ratio between government and industry. The share ratio is determined by the timing of the FMS case and the current state of the government contract. The type of contract the government already has with the industry partner sets the parameters for who receives more value from the case. We found a significant upward trend in the growth of FMS sales volume. Starting in the 2007 time frame we found a significant growth in FMS sales volume that continued to grow nearly exponentially through 2009. This growth represents a significant volume of sales that does not have a synchronized business strategy.

We developed recommendations and implications as a result of our case analysis and findings. These recommendations focus on developing a conceptual framework that proposes an integrated FMS strategy. In our recommendation we describe some of the necessary relationships between the security and business strategies and propose predictability and flexibility as essential components of a targeted FMS business strategy. The lack of predictability associated with FMS and government cost savings implies a need for the government to more effectively describe the value of the FMS program. Our study highlights the need to address the FMS Narrative, consider updating or enforcing policy, determine which government organizations should directly benefit from re-investible cost savings, and assess how organizations can better fit to achieve a synchronized approach.

Our analysis and findings are limited based on variety of factors. We purposefully selected cases to be illustrative of the FMS process and environment. However, these two cases represent only a small sample size and should not lead to concrete conclusions. Rather the findings from these cases allow for some generalization and for a more rigorous debate. Future research and study should focus on larger samples to confirm similar findings.

The topic of FMS and government cost savings and avoidance has further research potential. Further research opportunities revolve around organizational structure, policy, programming and budgeting. Is DOD 5000.02, Enclosure 2 specific enough to favorably integrate FMS into government acquisition strategy? The policy already requires programs to update acquisition strategy and foreign sales potential at each milestone. However, the policy does not direct any coordinating requirements to drive organizational synchronization. If program managers are able to effectively build in FMS and create savings in the production and contract efforts do they get to keep the savings? If savings are realized are program budgets necessarily reduce in future years? The government needs to determine which DOD organizations are value added for synchronizing a security and business strategy. They should specify how the liaison and leadership roles are defined across the duration of the FMS case. The government needs to address questions such as, should these roles change as the case matures or when does the security strategy or business strategy have priority?

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