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AN ANALYSIS OF PROGRAM MANAGERS AS TOTAL LIFE CYCLE SYSTEMS MANAGERS

September 2017

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Total Life Cycle Systems Management (TLCSM) is a term used in Army Regulation (AR) 70-1 to describe the responsibility of the Army Program Manager (PM). In this acquisition policy, the PM is made responsible for his/her assigned programs from initiation to disposal with no responsibility transitioning away from the PM. However, other Army guidance challenges AR 70-1 when transitioning to the Operations and Support phase of the acquisition life cycle. Furthermore, since the creation of the Life Cycle Management Commands (LCMC), obstacles have arisen as to whether the PM or LCMC is better equipped to manage program sustainment.

An evaluation of the roles and responsibilities of the PMs in acquisition sustainment transition was conducted to better assess their authority to carry out TLCSM. This thesis examined sustainment requirements and identified constraints and barriers to the transition process. It also addressed the advantages, disadvantages, and alternatives to having the PM act as TLCSM. Additionally, the flow of fiscal resources was analyzed to identify misalignments and limitations. Lastly, the authors concluded with four recommendations: issue a policy to elaborate PM/LCMC duties, give full funding responsibilities to the PM, identify the LCMC by Milestone B and remove the $250K threshold for investment purchases.

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AN ANALYSIS OF PROGRAM MANAGERS AS TOTAL LIFE CYCLE SYSTEMS MANAGERS

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ABSTRACT

Total Life Cycle Systems Management (TLCSM) is a term used in Army Regulation (AR) 70-1 to describe the responsibility of the Army Program Manager (PM). In this acquisition policy, the PM is made responsible for his/her assigned programs from initiation to disposal with no responsibility transitioning away from the PM. However, other Army guidance challenges AR 70-1 when transitioning to the Operations and Support phase of the acquisition life cycle. Furthermore, since the creation of the Life Cycle Management Commands (LCMC), obstacles have arisen as to whether the PM or LCMC is better equipped to manage program sustainment.

An evaluation of the roles and responsibilities of the PMs in acquisition sustainment transition was conducted to better assess their authority to carry out TLCSM. This thesis examined sustainment requirements and identified constraints and barriers to the transition process. It also addressed the advantages, disadvantages, and alternatives to having the PM act as TLCSM. Additionally, the flow of fiscal resources was analyzed to identify misalignments and limitations. Lastly, the authors concluded with four recommendations: issue a policy to elaborate PM/LCMC duties, give full funding responsibilities to the PM, identify the LCMC by Milestone B and remove the $250K threshold for investment purchases.

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LIST OF ACRONYMS AND ABBREVIATIONS

AAE	Army Acquisition Executive
ACAT	Acquisition Category
ACOM	Army Command
AL&T	Acquisition, Logistics, and Technology
AMC	Army Materiel Command
AMCOM	Aviation & Missile Life Cycle Management Command
AoA	Analysis of Alternative
AR	Army Regulation
ASA(ALT)	Assistant Secretary of the Army for Acquisition, Logistics, and Technology
ASCC	Army Service Component Commands
BES	Budget Estimate Submissions
CAE	Component Acquisition Executive
CECOM	Communications-Electronics Command Life Cycle Management Command
DAE	Defense Acquisition Executive
DAG	*Defense Acquisition Guidebook*
DAS	Defense Acquisition System
DFAS	Defense Finance and Accounting Service
DOD	Department of Defense
DOD FMR	*Department of Defense Financial Management Regulation*
DODD	Department of Defense Directive
DPG	Defense Planning Guidance
DRU	Direct Reporting Units
E911	Enhanced 911
EM2P	Emergency Management Modernization System
EMD	Engineering and Manufacturing Development
FORSCOM	Army Forces Command
FRP	Full Rate Production
FSA	Functional Support Agreements
HTAR	*How The Army Runs*
IOC	Initial Operating Capability
IPS	Integrated Product Support

JCIDS	Joint Capabilities Integration Development System
JMC/JM&L	Joint Munitions Command Joint Munitions and Lethality Life Cycle Management Command
KPP	Key Performance Parameters
KSA	Key System Attributes
LCM	Life Cycle Management
LCMC	Life Cycle Management Command
LCSP	Life Cycle Sustainment Plan
LRIP	Low Rate Initial Production
MDA	Milestone Decision Authority
MIPR	Military Interdepartmental Purchase Request
MOA	Memorandums of Agreements
MSA	Materiel Solution Analysis
MWNS	Mass Warning Notification System
NSS	National Security Strategy
O&S	Operations and Support
OMA	Operations and Maintenance, Army
OMB	Office of Management and Budget
OPA	Other Procurement, Army
OSD	Office of the Secretary of Defense
P&D	Production and Deployment
PB	President's Budget
PEO	Program Executive Officer
PHST	Packaging Handling Storage and Transportation
PM	Program Manager
POM	Program Objectives Memoranda
POR	Program of Record
PPBE	Planning, Programming, Budgeting, and Execution
PPBS	Planning, Programming, and Budgeting System
PPSS	Post Production Software Support
PSA	Product Support Agreements
PSBM	Product Support Business Model
PSI	Product Support Integrators
PSM	Product Support Manager
PSP	Product Support Package
PSPs	Product Support Providers

RAP	Resource Allocation Process
RDT&E	Research, Development, Test & Evaluation
RMA	Reliability, Maintainability, and Availability
RMD	Resource Management Decisions
SLA	Service Level Agreements
SSTS	Sustainment Systems Technical Support
TACOM	Tank & Automotive Command Life Cycle Management Command
TLCM	Total Life Cycle Manager
TLCSM	Total Life Cycle Systems Management
TMRR	Technology Maturation and Risk Reduction
TOC	Total Ownership Costs
TRADOC	Army Training and Doctrine Command
UFR	Unfunded Requirement
USD (C)	Under Secretary of Defense, Comptroller
USD(AT&L)	Under Secretary of the Defense for Acquisition, Logistics, and Technology

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I. INTRODUCTION AND BACKGROUND

A. INTRODUCTION

The United States Army Program Manager (PM) is assigned as the total life cycle systems manager (TLCSM) of the systems that they develop. Responsibilities of TLCSM include being responsible for and managing the system through its entire life cycle, from its inception through its disposal. This responsibility has been directed in a number of key documents to include Army Regulation (AR) 70-1 "Army Acquisition Policy," July 22, 2011, and Department of Defense (DOD) Directive 5000.01 "The Defense Acquisition System," November 20, 2007. The intent of this policy is to empower the PM to be the "designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. The PM shall be accountable for credible cost, schedule, and performance reporting to the Milestone Decision Authority (MDA)" (Department of Defense, 2007).

Despite the PM's assignment as written in AR and in DOD Directives, there are programmatic challenges and constraints that the PM must overcome in order to fulfill their responsibility as TLCSM. In the April 5, 2012, memo written by the Honorable Heidi Shyu, the United States assistant secretary of the Army for Acquisition, Logistics, and Technology (ASA[ALT]), PMs are directed to transition their systems to the Life Cycle Management Command (LCMC) for the sustainment phase of the system life cycle (Shyu, 2012). In addition, due to DOD funding restrictions, PMs are typically only funded through the program's production phase and are not funded to support a program in sustainment. The LCMC is funded for the sustainment of the system outside of the production phase. The PMs are responsible for developing a Life Cycle Sustainment Plan (LCSP) and the LCMC is funded based on that plan. Therefore, communication between the PM and LCMC is paramount for the LCMC to be properly resourced and ready to accept the system from the PM.

B. PREMISE

The purpose of this research is to determine the TLCSM responsibilities of the PMs, if there are funds allocation restrictions, and if they are mandated to transition system management to an LCMC. Currently, there is a disconnection between LCMC and PM responsibilities. There is conflicting documentation that assigns the authority of the program to the PM, but also assigns authority to the LCMC. This research will help clarify the lines of authority for life cycle management.

C. PROBLEM STATEMENT

Federal government policy, DOD directives and Army objectives direct the PMs to be the TLCSM but other policies restrict PMs from being system TLCSM. In an environment characterized by fiscal constraint, efficiencies are constantly sought and encouraged throughout the program acquisition life cycle. Proper organizational alignment, resourcing, and distribution of responsibilities are key factors in gaining the efficiencies necessary to achieve a higher return on the taxpayer's dollar. By assigning the PM as the TLCSM, "PMs are responsible and accountable for the life cycle management of their assigned programs" (Department of Defense, 2011, p. 2). However, it is evident that funding misalignment, improper resourcing and assignment of responsibilities have disempowered PMs from being true TLCSM.

D. BACKGROUND

In order to clarify this study further, a number of items will be addressed to allow a greater understanding of the research presented.

1. Who Is the PM?

It is imperative that we understand the roles and responsibilities of the organizations mentioned thus far.

According to DOD 5000.01, Chapter 3,

> 3.1. The Defense Acquisition System is the management process by which the Department of Defense provides effective, affordable, and timely systems to the users.

3.2. An Acquisition Program is a directed, funded effort that provides a new, improved, or continuing materiel, weapon or information system, or service capability in response to an approved need.

3.3. The Defense Acquisition Executive (DAE) is the USD(AT&L) who has responsibility for supervising the Defense Acquisition System. The DAE takes precedence on all acquisition matters after the Secretary and the Deputy Secretary (Army). [The DAE for the Army is the Acquisition, Logistics, and Technology (ASA(ALT)).]

3.4. The Milestone Decision Authority (MDA) is the designated individual with overall responsibility for a program. The MDA shall have the authority to approve entry of an acquisition program into the next phase of the acquisition process and shall be accountable for cost, schedule, and performance reporting to higher authority, including Congressional reporting. [MDA's are based on ACAT level, as shown in Table 1]

3.5. The Program Manager (PM) is the designated individual with responsibility for and authority to accomplish program objectives for development, production, and sustainment to meet the user's operational needs. The PM shall be accountable for credible cost, schedule, and performance reporting to the MDA. (Department of Defense, 2007, p. 2)

Table 1. MDA by ACAT Level. Adapted from "Milestone Decision Authority" (n.d.).

ACAT I and ACAT IA	Defense Acquisition Executive or as delegated.
ACAT IC and ACAT IAC	Head of the DOD Component or, if delegated, the Component Acquisition Executive (CAE) (not further delegable)
ACAT II	CAE or the individual designated by the CAE
ACAT III	Designated by the CAE

2. Who Is the LCMC?

There are three ACOMs subordinate to the Headquarters Department of Army, which are the Army Forces Command (FORSCOM), Army Materiel Command (AMC), and Army Training and Doctrine Command (TRADOC). The research conducted in this study will focus particular emphasis on AMC. The Army Service Component Commands (ASCC) and the Direct Reporting Units (DRU) shown in Figure 1 will not be addressed

in this study with regard to sustainment responsibilities. Through AMC, the LCMC accepts management responsibility of the system from the PM during the system's sustainment phase (Figure 2). Each LCMC is equipped with specific capabilities (such as aviation and missile, tank and automotive, or communications electronics management) and is responsible for sustaining the warfighter. The transfer of responsibility from PM to LCMC for sustainment is known as "sustainment transition" and will be discussed in further detail in the upcoming chapters.

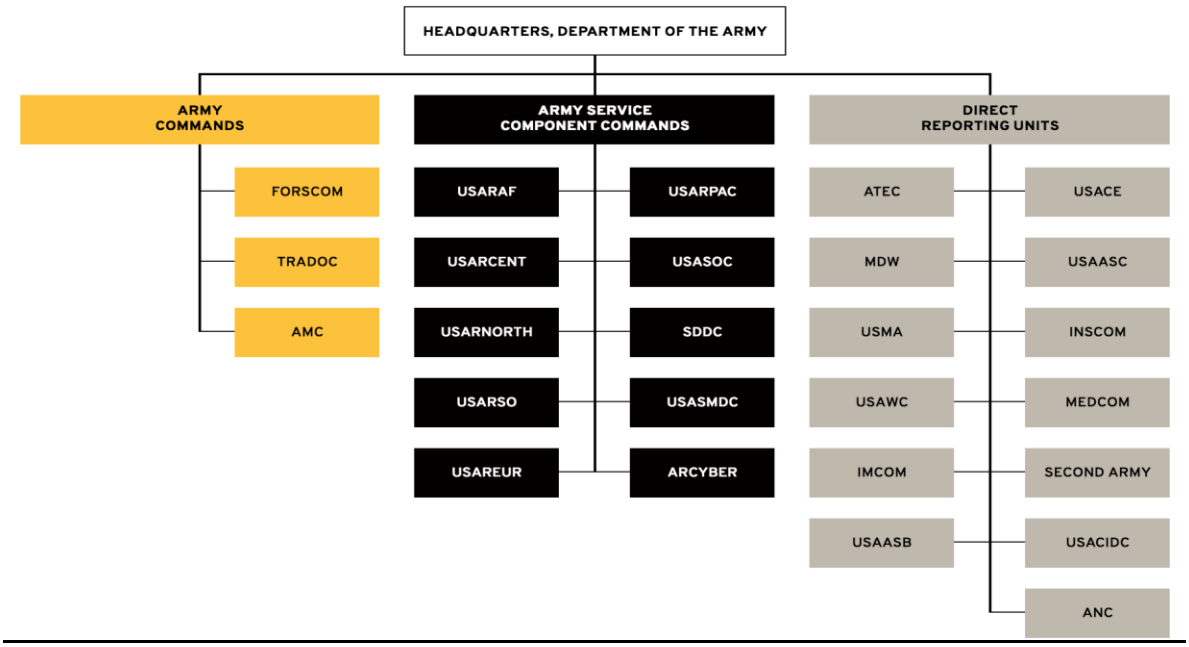

Figure 1. Army Hierarchy. Source: Department of the Army (n.d.-a).

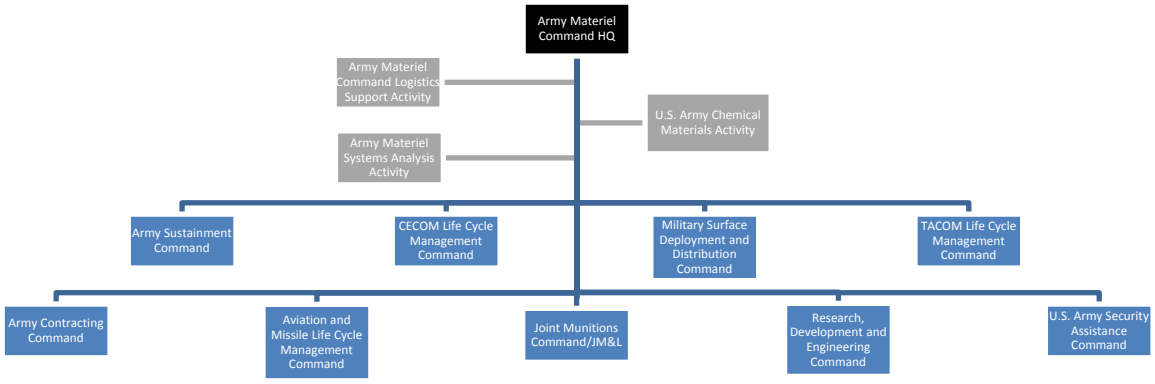

Figure 2. AMC Hierarchy. Adapted from Department of the Army (n.d.-b).

3. What Is the Program Life Cycle?

The life cycle approach is a systems engineering effort that spans the complete life cycle from the initiation of an item through disposal. The life cycle of a program follows the Defense Acquisition System, which is the "management process by which the Department of Defense provides effective, affordable, and timely systems to the users" (Department of Defense, 2007, p. 2). The acquisition system is a detailed process applicable to the entire life of any DOD program, consisting of three main processes: Joint Capabilities Integration Development System (JCIDS), Planning, Programming, Budgeting, and Execution (PPBE), and Acquisition. The JCIDS process primarily deals with requirements determination and is driven by the needs of the user. The PPBE process deals with the funding of the needs captured in the JCIDS and is calendar driven, occurring on an annual basis. The Acquisition process is focused on the development of products to fulfill the needs captured by the JCIDS and funded through PPBE.

> The PM shall be the single point of accountability for accomplishing program objectives for total life-cycle systems management, including sustainment. The PM shall apply human systems integration to optimize total system performance (hardware, software, and human), operational effectiveness, and suitability, survivability, safety, and affordability. PMs shall consider supportability, life cycle costs, performance, and schedule comparable in making program decisions. Planning for Operation and Support and the estimation of total ownership costs shall begin as early as possible. Supportability, a key component of

> performance, shall be considered throughout the system life cycle. (Department of Defense, 2007, p. 10)

E. SCOPE

The scope of this study consists of analyzing Army PMs and their life cycle management responsibilities. LCSPs will be analyzed to determine what PMs have planned and implemented for the life cycle of each program. The success of this study will be determined by the understanding and application of the information obtained through research of Federal policy, Army Regulations (AR), and DOD directives in addition to particular reports and case studies of Army programs where PM TLCSM responsibility applies. Only Programs of Record (POR) will be considered as part of this study.

F. PURPOSE OF THE STUDY

The purpose of this study is to determine whether the PM truly has the authority to be the TLCSM, despite being assigned the responsibility. While TLCSM responsibility holds the PM accountable, TLCSM authority would provide them with the full capability to command and control. This research will specifically focus on the laws, policies, regulations, and directives that create consternation concerning the PM's ability to be responsible as the TLCSM.

G. RESEARCH QUESTIONS

The following research questions will help create the framework to illustrate the existing challenges and constraints that impede the PM from having the authority to practice full TLCSM responsibilities. The three research based questions addressed in this project are as follows:

1. Should the PM have TLCSM responsibility and what are the alternatives?

2. What are the sustainment transition requirements?

3. What are the funding obstacles that limit the PM's abilities as the TLCSM?

H. IMPORTANCE OF THE STUDY

This study will focus on the PM's true authority to act as the TLCSM. By doing so, deficiencies and opportunities will manifest and lay the framework for clearer directives to be created for PMs as their programs progress through the life cycle. In an environment characterized by fiscal constraint, this study will find areas where the Army can gain fiscal efficiencies. The intent of this study is to capture the authoritative constraints that restrict the PM from truly gaining TLCSM responsibilities.

I. ASSUMPTIONS

Implicit in our study are a number of assumptions. These include the following:

1. PMs obtain insufficient OMA funds to support programs in sustainment.
2. The DOD and Army are seeking ways to gain greater fiscal efficiencies to reduce total ownership cost (TOC) for their programs.
3. AMC assigns LCMCs with management of systems in the sustainment phase.
4. The PEO and PM determine the appropriate LCMC based on the program requirements.

J. LIMITATIONS

This study describes and analyzes the misalignment of TLCSM responsibility and authority. Though this is applicable to all DOD services, this research focuses primarily on the Army. However, this should not discourage the broader application of our research outcomes.

K. SUMMARY

This chapter captures defined roles of the PM and AMC with regard to TLCSM responsibility and the system life cycle, to include sustainment. A problem statement has been established and research questions have been developed to answer that statement. In Chapter II, we will present the current concepts, regulations, guidance and policies that

affect the problem. We will also examine some of the best practices found within the Army enterprise. Finally, we will see how industry operates and compare and contrast their methods within the Defense Acquisition environment.

II. LITERATURE REVIEW

A. INTRODUCTION

In this chapter, we will uncover more details regarding the PM operating as the TLCSM. First, there will be a review of the DOD Decision Support System (Figures 3 and 4), which includes the Joint Capabilities and Development System (JCIDS), Planning, Programming, Budgeting, and Execution (PPBE), and Defense Acquisition System (DAS). The DAS is managed most closely by the PM and consist of contracting, sustainment, technical, and financial management functions. The PPBE, though managed more closely by other agencies such as the Office of the Secretary of Defense (OSD) and Congress, directly impacts the appropriation of funds that support specific efforts throughout the program's life cycle. For the purposes of our study, DAS and PPBE are most relevant and will be further discussed in Chapter II. There will also be a review of the Product Support Business Model (PSBM) and the Life Cycle Sustainment Plan (LCSP), diving deep into the sustainment aspect of the acquisition process. Next, an industry comparison detailing the best practices found in the private sector will be discussed. Finally, a historical review describing how and why AMC's LCMCs were created will be presented.

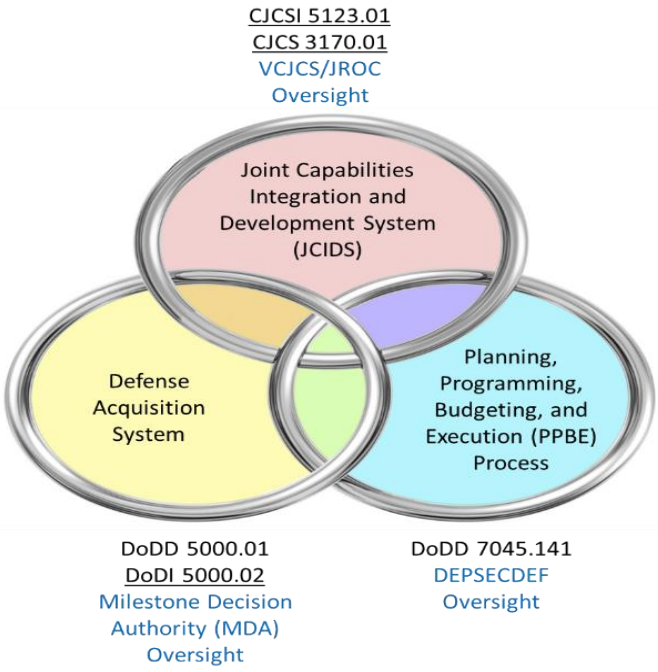

Figure 3. DOD Decision Support System. Source: Department of Defense (2004).

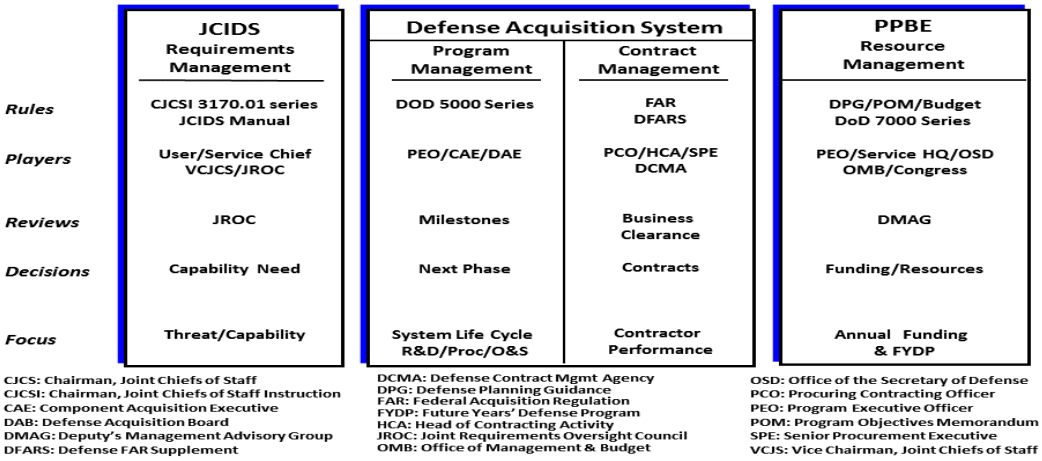

Figure 4. DOD Decision Support System Details. Source: Department of Defense (2004)

B. DOD SYSTEM ACQUISITION FRAMEWORK

Within the DOD Decision Support System, the execution of the actual acquisition framework is found within the Defense Acquisition System (DAS). The DAS is:

> The management process for all DOD acquisition programs. DOD 5000.01, Defense Acquisition System, provides the overarching management principles and mandatory policies that govern the DAS. DoDI 5000.02, Operation of the Defense Acquisition System, provides detailed procedures that guide the operation of the system through statutory and regulatory requirements that govern defense acquisition programs. (Department of Defense, 2004, Ch. 1-3.2.3)

The DAS provides acquisition personnel with a consistent process to achieve efficiencies while maintaining a standard. A key aspect of the DAS is that it is an event-driven process, meaning that specific milestones must be reached in order to progress through the DAS, regardless of how long it takes to reach those milestones. This enables further risk reduction as the program progresses though each milestone. The System Engineering Process (Figure 5) is a method to organize the technical processes that are needed to ensure the system is well structured. This process is a key component of the DAS and is vital for overall program success.

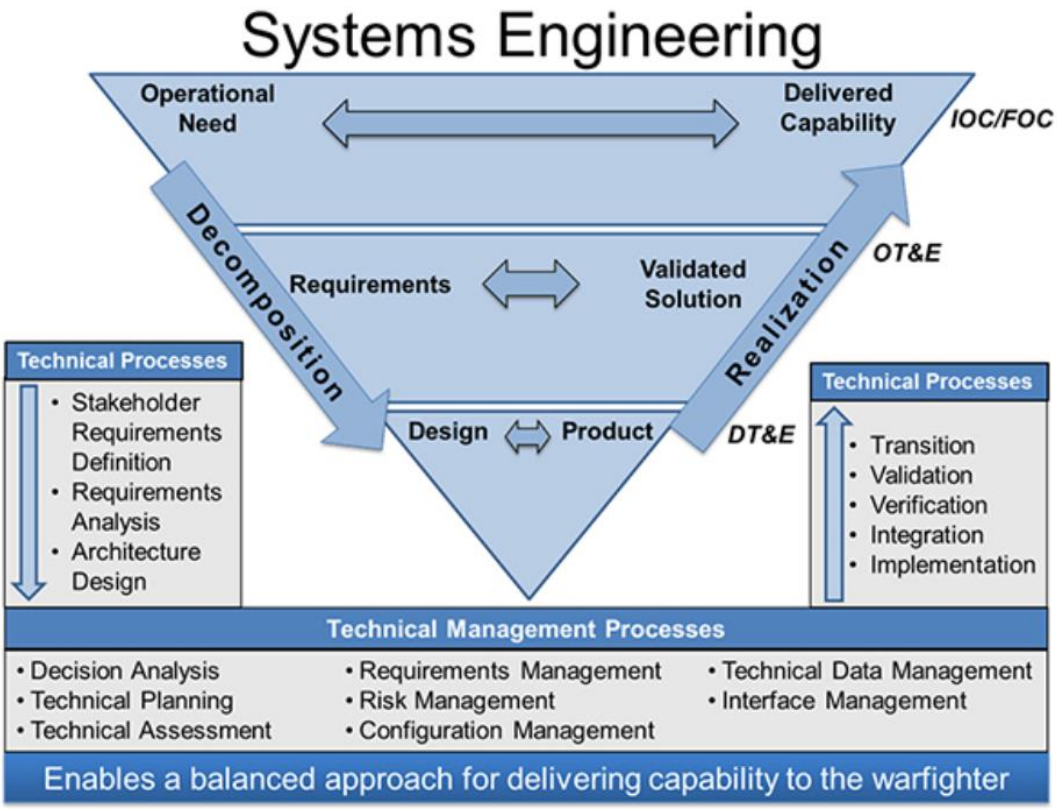

Figure 5. DOD System Engineering Process Model. Source: "System Engineering Process" (n.d.).

For our research, we will thoroughly explore the acquisition framework as it relates to the PM serving as the TLCSM. The *Defense Acquisition Guidebook* states that the "PM is the designated individual with the responsibility and authority to accomplish program objectives for development, production, and sustainment of a capability that satisfies validated user requirements. An effective PM has the 'big picture' perspective of the program, including in-depth knowledge of the interrelationships among its elements" (Department of Defense, 2004, Ch. 1-3.3.2). As shown in Figure 6, the PM is the management focal point for an acquisition program, regardless of the acquisition category or military component.

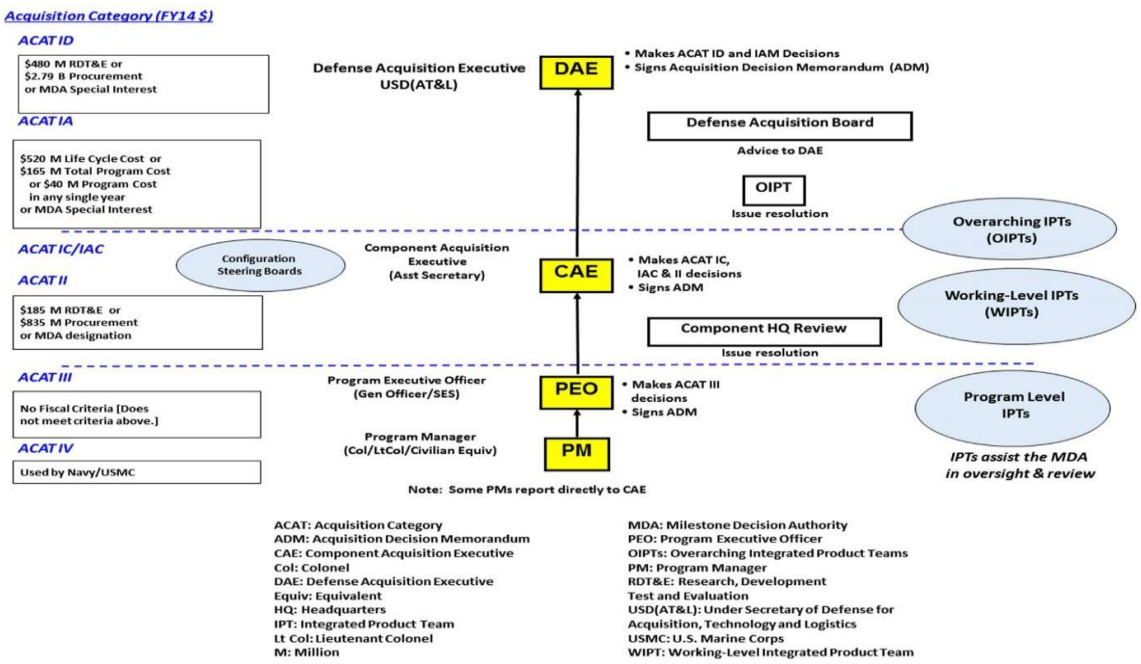

Figure 6. MDA by ACAT. Source: Department of Defense (2004).

Figure 7 shows a visual of the typical acquisition model. There are four other models and two hybrids that are some variation to this model below. The differences found in these variations are not relevant to the purposes of this study.

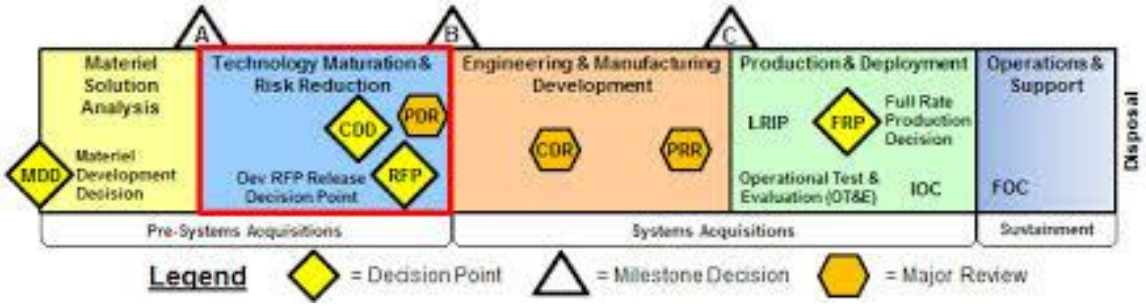

Figure 7. Typical Acquisition Model. Source: "Technology Maturation & Risk Reduction (TMRR) Phase" (n.d.).

The system addresses all life cycle stages from concept to disposal using this model. There are five phases, three milestones, and many documents, such as the Life Cycle Sustainment Plan (LCSP), that are required in an acquisition program. The five

phases are Materiel Solution Analysis (MSA), Technology Maturation and Risk Reduction (TMRR), Engineering and Manufacturing Development (EMD), Production and Deployment (P&D) and Operations and Support (O&S). There are certain requirements that need to be met to move on to the next phase.

MSA and TMRR together, makeup Pre-Systems Acquisition. During MSA, system specific requirements are beginning to be translated into validated capability gaps and the Component Acquisition Executive (CAE) selects a PM to manage the program acquisition. The TMRR phase, initiated at Milestone A, is characterized by design and requirements tradeoffs in an effort to reduce production risk and TOC.

EMD and P&D combine to make the Systems Acquisition portion of a program. The EMD phase begins Milestone B, and consists of the development of prototypes, detailed hardware and software design, and preparation for production and deployment. During the P&D phase, which begins Milestone C, the program ramps up to full rate production, and the system progresses toward full deployment and full operational capability.

The final phase is O&S, also known as Sustainment, and consists of satisfying materiel readiness, operational support performance requirements, and sustaining the system over the remaining life cycle through disposal. (Defense Acquisition University, 2014)

As documented in AR 700-142, the materiel release process ensures that “systems must be safe, suitable (meets operational performance requirements), and logistically supportable no later than the FRP decision and issue to Soldiers in the field” (Department of the Army, 2015, p. 17). Embedded in this process are event driven milestones that result in the accomplishment of all programmatically applicable safety, suitability and supportability requirements. This is a good process to determine system readiness for sustainment.

The PM has an immense responsibility with respect to completing all the tasks needed to lead their system through the acquisition process. Managing system cost, schedule, and performance, while reducing programmatic risk is key to ensuring program

success. In addition to planning Acquisition, the PM is responsible for planning sustainment. Sustainment planning must be conducted early in the acquisition cycle to enable the program to ensure design decisions support effective and efficient sustainability, reducing the overall TOC by keeping the costs and complexities to a minimum. The DAG states that "sustainment planning should begin as early as initial capability reviews as a best practice to ensure sustainment can be effectively executed when first production quantities are fielded" (Department of Defense, 2004, Ch. 1–3.4.3.2). This plan is documented in the Life Cycle Sustainment Plan (LCSP) and is updated before every phase moving through the DAS. The Product Support Manager (PSM), assigned by the PEO and tasked by the PM, is assigned the responsibility of producing the LCSP. The PSM's role will be discussed in further detail later in this chapter.

AR 70-1 states that "the PMs are responsible and accountable for the life cycle management of their assigned programs from program initiation through demilitarization and disposal. This is known as total life cycle systems management (TLCSM). There is no transition of life cycle management responsibility away from the PM" (Department of the Army, 2011, p. 2). Despite this guidance stated in AR 70-1, ASA(ALT) issued a memo that required PMs transition programs to various life cycle management commands (LCMCs) within the Army Materiel Command.

C. PLANNING, PROGRAMING, BUDGETING, EXECUTING (PPBE) MODEL

PPBE is the primary Resource Allocation Process (RAP) of DOD. It was created as a mechanism to plan for future needs and perform an annual review of the impending budget.

> It is a formal, systematic structure for making decisions on policy, strategy, and the development of forces and capabilities to accomplish anticipated missions. PPBE is an annual process which produces the Secretary's Defense Planning Guidance (DPG), five year approved Program Objectives Memoranda (POMs), and one-year Budget Estimate Submissions (BES) for the military departments and defense agencies, and the DOD portion of the President's Budget (PB). (Planning, Programming, Budgeting, and Execution (PPBE) Process, n.d.)

The Planning phase of PPBE begins with issuance of the National Security Strategy (NSS). The National Military Strategy details the DOD NSS roles and responsibilities. Based on the strategy, the Defense Planning Guidance (DPG) is issued and a five-year structure called the Future Years Defense Plan (FYDP) is developed to help PMs plan the resources of their program. This portion is called the Programming phase. The planned resources are "translated into detailed allocations of time-phased resource requirements that include forces, personnel, and funds." The Budgeting phase of the PPBE has two products that will be issued based on the work that is performed in this phase. The first is the Budget Estimate Submission (BES), which is the initial review of the budget that will eventually be sent as part of the President's Budget to Congress. From the BES, the Under Secretary of Defense, Comptroller (USD (C)) and the Office of Management and Budget (OMB) will review the complete DOD budget submission and issue Resource Management Decisions (RMD) to properly fund the programs to an appropriate level of affordability and need. After the RMDs are issued, the components will amend their budget requests and submit their new requests as part of the President's Budget to Congress. Once legislation is passed allowing Federal funds to be spent, the Execution phase begins.

> The purpose of the Execution Review is to assess what is received for the money spent (e.g., actual performance versus planned performance). Performance metrics are developed and used to measure program achievements and attainment of performance goals. These metrics are analyzed to determine whether resources have been appropriately allocated. (Department of Defense, 2004, Ch. 1–3.2.2.4)

The PPBE process is used to resource a program. The funding sometimes dictates the level of effort that can be afforded to meet the mission requirements. PMs make the hard decisions based on affordability, but should also fight for additional funding if the requirements necessitate additional resourcing. It is imperative that the PM is involved with the resourcing of their program. The PM's responsibility is to ensure that funding is properly executed and an appropriate amount is planned in the budget for the future years. This involvement needs to start as early as possible, such as during Pre-Systems Acquisition. This not only includes the research, development and production of the program but also the sustainment and disposal. Per Army Regulation 70-1, the PM's need

to work with AMC's LCMCs to ensure the sustainment funding requirements are in the Army's Budget. This is especially important since sustainment costs are usually about 75% of the programs cost. Although the PM is responsible for the program's execution from initiation to disposal, the majority, if not all, of the funding post-production is programmed to the AMC LCMC to continue program sustainment.

Through the PPBE process, the amount of funding allocated to each funding appropriation is determined. The three funding appropriations we will focus on are; research, development, test, and evaluation (RDT&E); Other Procurement Army (OPA); and Operations and Maintenance Army (OMA). Each funding appropriation supports Pre-Systems Acquisition, Systems Acquisition, and Sustainment activities.

D. PRODUCT SUPPORT BUSINESS MODEL (PSBM)

The Product Support Business Model (PSBM) is a model that captures and aids the PM in its TLCSM responsibilities. According to AcqNotes, "product support is the application of the package [called Product Support Package (PSP)] of integrated logistics elements and support functions necessary to sustain the readiness and operational capability of a system" ("Product Support," n.d.). There are 12 integrated logistics or product support elements that make up the PSP: manpower and personnel, maintenance planning, supply support, support equipment, design interface, training and training support, technical data, facilities, sustaining engineering, packaging handling storage and transportation (PHST), computer resource support, and product support management. Product support management is the integration of all twelve integrated product support (IPS) elements for the attainment of the system's supportability objectives, which are driven by its reliability, maintainability, and availability (RMA) goals. The product support manager (PSM) is the individual responsible for product support management and the integration of all product support elements to create the PSP.

It is captured in law, Title 10 USC 2337(b), that "The Secretary of Defense shall require that each major weapon system be supported by a product support manager…" (Life-cycle Management and Product Support, 2014). Each Program Executive Office (PEO) is responsible for assigning a product support manager (PSM) for each system in

its portfolio (Department of the Army, 2014, 1-16). With the PM assigned as the TLCSM, the PSM is tasked by the PM with the responsibility to "Provide weapon system product support subject matter expertise to the program manager (PM) for the execution of the PM's duties as the Total Life Cycle Systems Manager" (Department of Defense, 2016, p18). The PSM is therefore critical to the PM for the accomplishment of its TLCSM requirements. In order to aid the PM in the accomplishment of this objective, the PSM will use the PSBM as a tool to determine the optimal supportability strategy throughout the program life cycle.

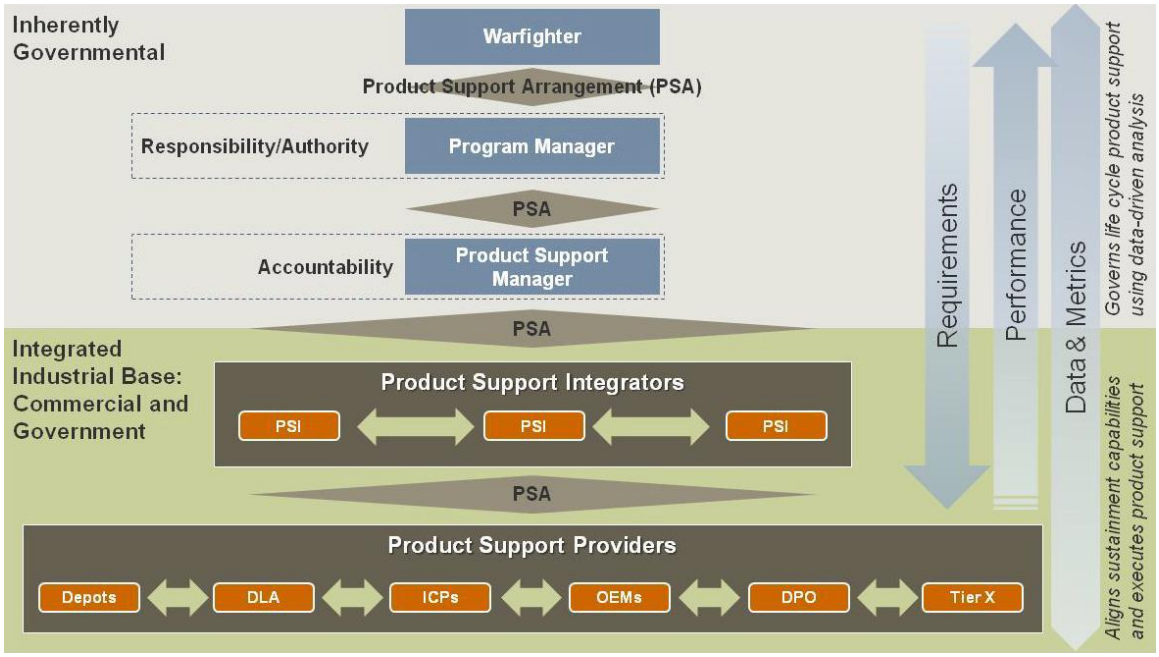

Figure 8. Framework of PSBM Roles and Responsibilities.
Source: Department of Defense (2016).

As shown in Figure 8, the PSBM begins with the Warfighter's requirements. Through Product Support Agreements (PSAs) between the Warfighter and the PM, the PM is to exercise its authority to accomplish its TLCSM responsibilities. The PM tasks the PSM, who is held accountable for enabling the PM, to obtain its TLCSM objectives, i.e., meet the Warfighter's requirements. The PSM engages Product Support Integrators (PSIs), who are responsible for management of individual product support elements or

for managing the integration of multiple product support elements. For instance, a PSI may be responsible for managing all aspects of supply or be responsible for integrating supply, maintenance planning, and PHST functions. PSIs are responsible for managing the work of Product Support Providers (PSPs) whom are responsible for specific functions. For example, a PSP may be responsible for storing, shipping, and receiving system components while another may be responsible for providing computer resource and technical support. All relationships between the Warfighter, PM, PSM, PSI, and PSP are managed via PSAs and are captured in the program's Life Cycle Sustainment Plan (LCSP).

PSAs between the Warfighter, PM, and PSM, are non-contractual since these are inherently governmental activities. Instead, they often are comprised of specific agreements such as memorandums of agreements (MOAs), service level agreements (SLAs), or functional support agreements (FSAs). PSAs between the PSM, PSIs, and PSPs may consist of non-contractual agreements if the PSIs or PSPs are Government entities. However, they may also consist of contracts if the PSIs or PSPs are contractors. The reason for this is, unlike the relationship between the Warfighter and PM or the PM and the PSM that is inherently governmental, the relationship between PSM and PSI or PSI and PSP is either is public (government), private (commercial), or public-private partnership (integrated industrial base).

E. LIFE CYCLE SUSTAINMENT PLAN (LCSP)

The LCSP is the document created by the PM that will describe, "how product support will be developed and implemented" (Department of Defense, 2016, p16) by the PSM. It will capture the program's PSP and identify how all product support elements have been integrated to enable the PM to achieve its sustainment objectives. Through the integration of the product support elements, it will detail the analyses and analytical processes utilized to determine the optimal sustainment strategy. These analytical processes are enablers for the PM to determine how the program will be sustained throughout its life cycle, particularly during the operations and sustainment (O&S) phase, which will consume most of a system's funding resources.

F. INDUSTRY COMPARISON

In industry, there are two concepts adopted by corporations that are equivalent to the TLCSM approach applied in the DOD. These two concepts are known as vertical integration and full stacking.

Vertical integration is a strategy that allows companies to have increased control of their value chain. It is "the merging together of two businesses that are at different stages of production" ("Vertical Integration," 2009). Depending on where that company is along the value chain, they can integrate "upstream" or "downstream." For example, a distribution company may seek to acquire control of the production of its products (upstream) or the selling of its products to the consumer (downstream). Companies may accomplish this integration through mergers and acquisitions, or by organically expanding its operation along the value chain. Vertical integration is a strategy employed by various companies to include Starbucks, Delta Airlines, Netflix, and Amazon (Favaro, 2015).

Full stacking is much like vertical integration, except rather than integrating either upstream or downstream, it integrates the entire "stream." In other words, with full stacking, a company will control the entire value chain from material sourcing and production, to marketing and delivering the product to the consumer. It's been seen in many technology startups to include Apple, Uber, Nest, and Tesla (The Apple Approach: What is a Full Stack Startup, 2017). When comparing full stacking and vertical integration, the "difference is the focus on the customer experience" (The Apple Approach: What is a Full Stack Startup, 2017). Full stacking is always focused downstream controlling how the product is delivered to the consumer; whereas vertical integration may be focused either up or downstream.

To successfully implement vertical integration and full stacking requires that a company be good at many different aspects of business, from hardware to software, manufacturing to distribution, and selling and marketing (The Apple Approach: What is a Full Stack Startup, 2017). Implementing this can be very costly and time-intensive.

Favaro points out that vertical integration and full stacking are successful strategies when two conditions are met: (1) a market failure and (2) the power to correct it.

> The first is a "market failure" that is hurting your business; the most common are supply risk, demand risk, and profit gouging. The second is that you have the power or capabilities to fix and even exploit that market failure…And without the power or capabilities to exploit a market failure, it's a very risky strategy. (Favaro, 2015)

Unless there is a failure or high risk in the value chain vertical integration or full stacking is not applicable. Even in cases where these conditions exist, if a company does not have the ability to control these weaknesses in its value chain vertical integration and full stacking strategies are not viable options.

It is notable that even in industry, vertical integration and full stacking strategies are not applied by every corporation or for every product or service. The strategy chosen all depends on the circumstances and capabilities of the corporation. There is no one single strategy when providing a product or service to the end user. Depending on the product or service and capability of the corporation, corporations will choose whether to adapt vertical integration or a full stacking approach.

G. LIFE CYCLE MANAGEMENT COMMAND HISTORY

> On Aug. 2, 2004, Army Acquisition Executive (AAE)/Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASAALT) Claude M. Bolton, Jr., and U.S. Army Materiel Command (AMC) Commanding General Paul J. Kern signed a historic Memorandum of Agreement formally establishing the Army's Life Cycle Management (LCM) initiative. The initiative's objective was to create a synergy that would enhance the efficiency and effectiveness of the Army's Acquisition, Logistics and Technology (AL&T) Workforce in delivering better products and capabilities to our Soldiers faster, while also minimizing total life-cycle cost across an entire grouping of systems. (Army AL&T, 2006, p. 3)

The LCMCs were created to provide quicker delivery of capabilities to the warfighter. Lean Six Sigma principles were used to correctly deliver the products faster and cheaper. Claude M. Bolton Jr., the Army Acquisition Executive at the time, stated:

> It is imperative that we continue to provide products to the Soldier faster, make good products even better, minimize life-cycle costs and enhance the synergy and effectiveness of our Army's acquisition, logistics and technology community. It is our job to work constantly to provide much

> better capability to the Soldier as quickly as possible. (Army AL&T, 2006, p. 2)

There are four LCMCs: Aviation & Missile Life Cycle Management Command (AMCOM), Joint Munitions Command Joint Munitions and Lethality Life Cycle Management Command (JMC/JM&L), Communications-Electronics Command Life Cycle Management Command (CECOM), and the Tank & Automotive Command Life Cycle Management Command (TACOM).

AMCOM LCMC, formed in October 2004, has the primary responsibility for the life cycle of all the Army's aviation and missile weapon systems. JMC/JM&L LCMC, formed in November 2006, has the primary responsibility for the life cycle of all the Army's conventional munitions. CECOM, re-designated as an LCMC in 2005, provides "Soldiers with command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) tools and systems that are highly developed, sustainable, reliable, usable and technologically current" (Army AL&T, 2006, p. 26). TACOM, re-designated as an LCMC in 2004, has the primary responsibility for the life cycle of all the Army's vehicles, equipment, weaponry, and support systems used by U.S. soldiers on the ground.

Once the product is fielded, the sustainment responsibilities are placed on the LCMC with the PM's oversight. If there is warfighter need/modification to the product or system, the LCMC will relay that message to the PM to work on developing a solution. The PM is still "the single point of contact in terms of that weapon system" (Army AL&T, 2006, p. 35). The intent of combining the acquisition and logistic experts enhanced the responsiveness to the warfighter's needs. This was especially important during time of crisis. Since the inception of the LCMCs, there are many documented success stories on how the LCMCs have streamlined the linkage between the acquisition workforce and the warfighter. A successful transition to the LCMC could occur as long as there is constant communication and understanding between a functioning LCMC and PM. Outside efforts could cause a barrier to this effort and for every success story, there are oversights and failures.

PEOs and PMs try to plan for a successful transition to the sustaining organization but plans tend to change or do not come to fruition. This was the case with the Emergency Management Modernization Program (EM2P). This product was a directed requirement that began in 2012 because of the studies found from the first Fort Hood shooting and fielded capabilities to 75 various Army Garrisons and Installations by 2016. The capabilities this product shop provided were a Mass Warning Notification System (MWNS) and an Enhanced 911 (E911) service. The PM tried multiple times to keep the product shop open for continuous modernization, upgrades, and improvements, but the customer (Army G-3/4) decided to just fund the sustainment of the current systems. One year later, after the program initiated the transition to the LCMC (in this case, it was TACOM), some installation's E911 systems are aging and are in need of modernization. Since there are some remnants of EM2P still available and the support contract has not officially ended, the PM was able to support these efforts. If similar but new efforts happen in 2018, there will be no Program in place to coordinate these efforts. Now, the Army needs to find a way to keep this important tool sustainable to protect the Army warfighter and their families on the Installations.

H. SUMMARY

In Chapter II, various sources were examined to compile pertinent regulations, statutes, guides, and best practices that will help determine the answers to the thesis statement. In the next chapter, the research questions presented in Chapter I will be answered and analyzed. Once again, those questions are:

1. Should the PM have TLCSM responsibility and what are the alternatives?
2. What are the sustainment transition requirements?
3. What are the funding obstacles that limit the PM's abilities as the TLCSM?

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III. DATA

In Chapter III, we will compile the data for the research questions that were introduced in Chapter I. In Chapter IV, the data from these questions will be analyzed and will provide us the information to determine if the PM is truly the TLCSM.

A. SHOULD THE PM HAVE TLCSM RESPONSIBILITY AND WHAT ARE THE ALTERNATIVES?

In order to answer this question, we should examine the advantages and disadvantages of transitioning the life cycle responsibilities away from the PMs. The first and most obvious advantage is that the LCMC now becomes the sole party responsible for all decisions with regard to the sustainment of the program. By the LCMC becoming responsible, inherently, the proper funding allocation will also need to align with this responsibility. This also will take the PM out of the equation for sustainment and will allow the PM to focus on acquisition of new materiel solutions or the modernization of existing products. Having life cycle management transition away from the PM is especially helpful if the PM (and/or the PEO) is disbanded, leaving minimal reach back support for the LCMC. Should the responsibilities transition to the LCMC, it would benefit the LCMC to try and employ some of the Government civilians, contractors, or military that worked on the product development. This will ensure the continuation of the institutional knowledge that would have otherwise been lost in transition.

The disadvantages of transitioning the life cycle responsibilities away from the PMs centers around the learning curve associated with gaining the responsibilities of the product. The sustainment of the product will suffer unless the LCMC representatives spend a sufficient amount of time to understand the intricacies of the product. This is even more evident in software intensive programs where the learning curve tends to be greater. It is more difficult to transition software programs, given that software cannot be supported as a commodity, and software-intensive system PMs never (or should never) fully go out of business or completely hand over their systems to the LCMCs. In addition, the LCMC may be tempted to make non-developmental alterations to the product.

> A major focus during the sustainment effort of the Operations and Support (O&S) Phase is identifying root causes and resolutions for safety and critical readiness degrading issues. These efforts include participating in trade studies and decision-making relative to changes to the product support package, process improvements, modifications, upgrades, and future increments of the system. All these changes need to consider the operational needs and the remaining expected service life, interoperability or technology improvements, parts or manufacturing obsolescence, aging aircraft (or system) issues, premature failures, changes in fuel or lubricants, and Joint or service commonality. ("Operations and Support (O&S) Phase," n.d.)

Without the PM, the LCMC will be unable to make any improvements, modifications and upgrades. These changes present limitations within acquisition process and appropriated funding.

An alternative to the PM maintaining responsibility for TLCSM is for programs to transition from the PM for management by Army Commands (ACOMs) during the Operations and Support (O&S) phase. This model of transitioning management responsibility is captured in an audit report completed by the Office of the Inspector General on Army missile acquisition (Department of Defense, 1997). In this model, Army PMs of missile programs transitioned responsibility to the ACOMs during the sustainment phase. Generally, this process worked well; however, the report did capture limitations that hindered sustainment objectives. These limitations included a lack of Operations and Maintenance (O&M) funding provided by the Army Chief of Staff to the ACOMs to correct missile deficiencies and inadequate maintenance training provided by the PM. The outcome of these limitations was the ACOMs not meeting sustainment readiness objectives. (Department of Defense, 1997)

As a best practice, in order to avoid these issues and streamline the sustainment transition process, LCMCs may provide personnel support directly to the PM through a functional support agreement (FSA); this is known as matrix support. This matrix support is embedded in the PM as early in the life cycle as possible to ensure sustainment risks are mitigated and incorporated into the program during development. With the LCMC matrix support, programs are able to mitigate sustainment risks by the time the program reaches the sustainment phase. This will enable an efficient sustainment transition and

facilitate the accomplishment of sustainment readiness objectives. This personnel structure allows the PM to retain its core personnel for the development of new materiel solutions, upgrades, and modifications, while still maintaining flexibility in retaining or relinquishing matrix support for sustainment.

It is also worth noting that DOD Audit Report No. 91-197 captured that a reduction in Army staff would result from the transition of systems from PMs to ACOMs. When discussing transitioning programs away from PMs, DOD Audit Report No. 91-197 states that a reduction in Army staff was the major intent. "The Army generally cuts program management staffing in half when programs transition to commodity commands" (Department of Defense, 1997, p2). The transition of systems, especially a surge in transitioning these systems, from PMs to ACOMs is a key strategy when the Army wants to accomplish large reductions in staff.

B. WHAT ARE THE SUSTAINMENT TRANSITION REQUIREMENTS?

DOD and Army doctrine indicate that transition requirements are inconsistent, varying over the course of time and by program. In a March 1996 version of DOD Regulation 5000.2-R, it states that "in order to transition from a PEO to a commander of a systems, logistics, or materiel command, a program shall, at a minimum, have passed Initial Operating Capability (IOC), have achieved full-rate production, and be logistically supportable as planned (Department of Defense, 1996, p13)." Audit Report No. 91-197 references a 1995 version of Army Pamphlet 70-3, which "requires that the program management office develop a transition plan and that the gaining functional manager and the program Milestone Decision Authority approve the transition plan" (Department of Defense, 1997, p. 2). It is notable that the guidance referenced is primarily event driven. In other words, specific qualitative milestones must be achieved which indicate the maturity level of the program for transitioning.

According to Government Accountability Office (2005), the specific transition requirements provided by the Under Secretary of Defense for Acquisition, Technology and Logistics are the following:

> (1) testing demonstrates that an element or component is mature, (2) plans and resources are in place to ensure that facilities are available to support production, and (3) funds are programmed in DOD's Future Years Defense Program to carry out production plans. (Francis, 2005, p. 8)

In recent guidance, Shyu states that "weapon systems will transition into their SSTS [sustainment systems technical support] and the PPSS [post production software support] phases in the 1st full FY after the end of production. The end of production is marked by the last item rolling off the production line." In this guidance, it is notable that the guidance is more schedule driven, not event driven. There is no specific mention of proven logistics supportability, contracting or funding milestones being met, or other qualitative indicators of a program's maturity in order to transition a system. Rather, it is primarily driven by production and must occur during the first full FY following production completion. A reduced workforce is also expected as a result of this transition. Shyu states that

> The PMs should expect a decline to the workforce requirements in recognition of the reduced workload required to sustain a weapon system in a post production environment. Not later than two years prior to the end of production, the PMs will produce and submit a concept plan to reflect the reduced organizational structure for the management of programs in sustainment to include the Office of the Secretary of Defense mandated Product Support Manager. Funding for this workforce will reside within the SS PEG. (Shyu, 2012, p. 2)

In AR 700-127, it mentions that the objective support concept transition plan milestone is to occur no later than two years after full rate production decision. The objective support plan captures how the system will be sustained or supported through the sustainment phase of the life cycle. This milestone is to be captured in the program's LCSP (Department of the Army, 2014).

While some programs developed agreements to transition full life cycle management responsibility away from the PM to the LCMC during sustainment phase (Enterprise Information Systems, 2011), which directly violates the concept of PM as the TLCSM, other programs developed agreements in line with the PM being TLCSM while delegating specific sustainment functions to various activities to include the LCMC, Defense Logistics Agency, and other PMs (Enterprise Information Systems, 2014). These

sustainment functions may include management of consumable parts, depot maintenance activities, and software maintenance.

C. WHAT ARE THE FUNDING OBSTACLES THAT LIMIT THE PM'S ABILITIES AS THE TLCSM?

In this section, we will discuss obstacles a PM faces when dealing with Congressional appropriated funds. We will further explore the execution phase of the PPBE model, define an obligation and expenditure and explain how they occur, review the process of how defense programs are graded through performance measures, and define any flaws or misalignments in these processes.

The PPBE model was discussed earlier in Chapter II, but we need to further examine the execution phase to gain a better understanding of how acquisition programs are evaluated. As stated before, the execution phase begins after legislation is passed. To be more specific, the beginning of budget execution is after Congress passes the appropriations act and the Office of Management and Budget (OMB) apportions and allocates budget authority down to the Office of the Secretary of Defense (OSD). At this point, OSD further allocates budget authority to the Army, creating performance measures and goals for each appropriation. The Army then creates their own performance measures and goals, usually a few percentages higher than the OSD goals in order to safeguard accomplishment (Krott, 2017, p. C-165). These metrics and goals are in the form of obligation and expenditure rates.

Before going further, we need to explain obligations, expenditures, and funding appropriations with their limitations. The Department of Defense Financial Management Regulation (DOD FMR) defines an obligation as a "binding agreement that will result in outlays immediately or in the future" (Department of Defense, 2017, p1-14). An expenditure, synonymous with outlay, is defined as "the amount of checks issued or other payments made (including advances to others), net of refunds and reimbursements collected" (Department of Defense, 2017, p1-14). There are multiple methods of how an obligation or an expenditure can occur. Some examples of when an obligation occurs are when a contract is signed by both the contractor and the government, when a Military

Interdepartmental Purchase Request (MIPR) is accepted from another government agency, or when a travel order is signed by the authorizing government official. The obligation must occur before the expenditure, or in some cases simultaneously, such as when labor costs are incurred. In order for an expenditure to occur as a result of an obligation, an invoice must be submitted in a Government information system, and then the Defense Finance and Accounting Service (DFAS) must post payment in the appropriate accounting system. Any interruption in these processes can cause a delay in an obligation or expenditure, and could ultimately cause a program to fall behind the goals of OSD.

The obligation period is the amount of time the appropriation can incur new obligations. Typically, the RDT&E appropriation is used early in the life cycle for research, development, design and testing and has a two-year obligation period. The OPA appropriation has a three-year obligation period and usually begins around milestone C, when LRIP begins, and supports the production phase. Once the system moves into the sustainment phase, OMA is the bill payer for essentially all expenses, excluding a few restrictions, which will be discussed later in this section. The OMA appropriation has a one-year obligation period. After the obligation period has come to a close, the budget authority is considered expired and no longer available for new obligations. All three appropriations have five years after expiration to fully liquidate any outstanding obligations.

This information about appropriations and their periods of availability is essential for the PMs when creating their spend plans. For example, when making budget plans for OPA funds, the PM would estimate how much budget authority will be obligated each year for the next three years. In addition, the PM would estimate when the budget authority would be expended during its three-year obligation period plus its five-year liquidation period. This means the PM will sometimes be required to build a monthly spend plan for obligations for the next three years and for expenditures for one appropriation for the next eight years.

We have defined an obligation and an expenditure, and the actions that are necessary to take place before they can occur. We have discussed the three Congressional

appropriations, their limitations, and the process of planning for execution. Now we can focus on the scrutiny the OSD and Army places on the programs to meet their respective plan. OSD and the Army create execution goals for each program to evaluate performance (Krott, 2017, p. C-165). These goals will vary by program and agency, but the premise is the same. For example, a program in sustainment with an annual budget authority of $4M could be required to obligate $1M each quarter. If this goal is not met, the PM will be called upon to defend and justify the details as to why the program is not executing their budget according to the spend plan (How the Army runs, 2015-2016, p. 8-44).

There are a few issues with this method of evaluating execution. First, once a program falls behind plan, the budget authority is at risk of being reduced in the current execution year. Usually, when this trend continues, the budget authority is transferred to another program that is ahead of their respective execution goals. Because of this, there is no incentive to be good stewards of taxpayer money, but rather to place an emphasis on meeting a spending goal. Program managers are usually given a chance to argue their position before losing budget authority, but the decision ultimately lies with the agency, OSD, or Congress (Krott, 2017, p. C-171)

Another situation that exists, now that the PM has become the TLCSM, is the flow of budget authority from the Army. As mentioned in the introduction, the PM is typically funded with RDT&E and Procurement funds to support the development and acquisition of the system. Once the system enters the sustainment phase, the flow of OMA authority goes to the LCMC, instead. This limits the PM's ability to have full control over OMA funding during sustainment and meeting OSD goals for execution. The PM is creating spend plans, maintenance schedules, and a LCSP for the program, however the budget authority for OMA funds still lies at the LCMC. As put by the January-February 2005 issue of The Army Logistician, "…holding PMs accountable for sustainment continues to be particularly challenging because planning, programming, budgeting, and execution of sustainment funding largely reside in the Army Materiel Command (AMC), not with PMs" (Winbush, Rinaldi, and Giardina, 2005, p. 2).

An additional hurdle the PM faces is the expense vs. investment threshold restriction on OMA funds that can sometimes cause a delay in acquiring equipment items

and spare parts. According to the DOD FMR, "The criteria for cost definitions consider the intrinsic or innate qualities of the item such as durability in the case of an investment cost or consumability in the case of an operating cost and the conditional circumstances under which an item is used or the way it is managed." (Department of Defense, 2017, p. 1-20). This means purchases must be categorized as either an expense item or an investment item (Figure 9).

Expense/Investment Cost Determination

Is the item a	If	Then	If	Then	If	Then
Centrally Managed/ Asset Controlled Item?	Yes	Is this item purchase from DWCF?	Yes	Is the item part of a full funding effort?*	Yes	Classify as Investment
					No	Classify as Expense
			No	Classify as Investment		
	No	Is the unit cost more than $250,000	Yes	Classify as Investment		
			No	Classify as Expense		

* When intended for use in weapon system outfitting, government furnished material on new procurement contracts or for installation as part of a weapon as part of a weapon system modification, major reactivation or major service life extension.

Figure 9. Expense/Investment Cost Determination.
Source: *Fiscal Law Deskbook* (2005).

The OMA appropriation is the bill payer for expense items and OPA is the bill payer for investment items. According to DOD FMR, expenses are "assemblies, spares and repair parts, and other items of equipment that are not designated for centralized item management and asset control and which have a system unit cost less than the currently approved dollar threshold of $250,000 for expense and investment determinations" (Department of the Defense, 2017, p. 1-21). This means that if a system is managed during the sustainment phase by an LCMC with OMA budget authority, and the item needed is over the $250,000 threshold, then OPA funds must be utilized. Since the PM has OPA budget authority the LCMC will need to reach back to the PM for funding.

IV. FINDINGS AND RESULTS

In Chapter IV, we will analyze the data from Chapter III to determine the PM's ability to be the TLCSM.

A. SHOULD THE PM HAVE TLCSM RESPONSIBILITY AND WHAT ARE THE ALTERNATIVES?

In Chapter III, the advantages and disadvantages of the PM transitioning away the life cycle management responsibilities were examined. Some of the alternatives were also discussed (Responsibility lies with LCMC, PM strengthens full responsibility with financial control of sustainment funds, ACOM program management during the O&S phase). The decision to change what is stated in the regulation (PM as the TLCSM) is contingent on how viable the alternatives are. The research shows that keeping the PM as the TLCSM does keep a consistent path forward with the fielded program. The current process also creates a division between responsibility and authority (represented by the OMA funding) and there needs to be better communication and structure with the transition.

Ultimately, the point of transitioning responsibilities is to create a more efficient environment in the sustainment of the fielded products. By keeping a portion of the PM shop still operational, you maintain the institutional knowledge while transitioning the maintenance portion to the LCMC. This is especially important to consider in software intensive programs where the sustainment and maintenance of software becomes increasingly more difficult as the system components reach obsolescence and technology refresh thresholds. Having a sustainment team in place at the PM shop keeps consistency throughout the O&S phase.

The size of the remaining PM shop should depend on the complexity of the program. At a minimum, the remaining PM support staff to the LCMC should include system engineers, software engineers (if applicable), and logisticians. These individuals would work closely with the LCMC to continue the success of the program. If the PEO/PM is disbanded, the LCMC should make every effort to maintain key personnel

from the departing program office. Otherwise, the LCMC will have to operate blindly when programmatic decisions need to be made. The LCMC will also be unable to perform any upgrade without a PM office to work the acquisition requirements. Keeping the PEO/PM office open will be an Army decision, but the PM and LCMC will need to make a conscience effort to portray that message to the Army.

The current Army acquisition process seems to work well, but the transition of O&S responsibilities is lacking. The Army has a few guides on how to prepare for the transition, but the transition execution needs to be more rigid. Currently, the two main transition tools that are used are the LCSP template, which lays out the responsibilities of the commands, and the Product Support Manager's guidebook, which is a great tool that

> delineates processes for outcome goals of systems, ensures that responsibilities are assigned, provides incentives for attaining these goals, and facilitates the overall life-cycle management of system reliability, availability, supportability, and life cycle costs. (Department of Defense, 2016, p. 7)

In order for these tools to be used properly, planning and executing early will help keep costs down and productivity up. Identifying and including the LCMC early in the acquisition cycle will strengthen the PM's and LCMC's abilities to execute a more streamlined transition. This will also create a relationship that will help properly fund both the PM and LCMC through the entire life cycle of the program.

B. WHAT ARE THE SUSTAINMENT TRANSITION REQUIREMENTS?

In order for there to be uniformity in how a system transitions away from the PM to another organization for sustainment management, the Army leadership must be consistent in its guidance. Doing so will minimize confusion and aid the PMs, and organizations such as the LCMCs, in acquisition life cycle planning.

Rather than redeveloping sustainment transition requirements, the Army may consider leveraging a process it already established, called materiel release. Utilizing the materiel release process as a standard would create a foundation of requirements that Army leadership can apply to all acquisition programs. In doing so, it can then be

captured in Army regulation that materiel release shall be the process to determine the adequacy of sustainment transition away from the PM.

If the PM is truly granted TLCSM authority and it is determined that sustainment shall remain with the PM rather than transition away from it, the materiel release process can still be used by the MDA to determine if the PM will receive OMA funds to sustain their program. Of course, this presumes that the PM would be granted greater flexibility in utilizing all funding appropriations, particularly OMA funding, which it is often most limited.

C. WHAT ARE THE FUNDING OBSTACLES THAT LIMIT THE PM'S ABILITIES AS THE TLCSM?

Evaluating a program exclusively on its execution rates against a predetermined schedule is an arbitrary process in that it only considers a time-based spending model, leaving little flexibility for dealing with inevitable issues. The USD (Comptroller) collaborated with the USD AT&L to publish a memo concerning this process. The memo states that, "the threat that funding will be taken away or that future budgets can be reduced unless funds are obligated on schedule is a strong and perverse motivator," (Hale and Kendall, 2012). The memo goes on to recommend six principles be adopted throughout the DOD. Summaries of these are that obligation rates should not be used to measure the performance of a program and lagging rates should not assume failure. When obligation rates are behind schedule, it should not be assumed that funds are not needed or that future amounts should be reduced. Resourceful spending should always be in the taxpayers' interest and savings should be encouraged and properly rewarded (Hale and Kendall, 2012). These new principles were to be implemented in 2012. However, no official DOD guidance or regulation has been issued.

In 2014, the U.S. Senate requested information from leading experts, which could lead to acquisition improvements. Another note from Kendall, USD AT&L, wrote the following:

> Reduce the counter-productive incentive to obligate funds on a fixed schedule. For 4 years I have worked to train and encourage our acquisition workforce to take time to get good business deals for the Taxpayer by

> conducting appropriate upfront analysis, and by doing the systems engineering and planning necessary for successful programs. At the same time our program managers live in a world in which they are punished for not obligating the funds they control on set schedules. We should have realistic plans to execute our budgets, but when a manager has sound reasons to delay obligation, that behavior should not be punished. I have worked successfully with the Under Secretary of Defense (Comptroller) to provide a more balanced approach to how we handle obligation reviews within the Department, and we would like to work closely with Congress in striking a similar balance on this matter. (United States Senate, 2014, p. 115)

Kendall also wrote in his 2016 report, Performance of the Defense Acquisition System, that: "Measuring program financial performance solely on goals can be problematic. Performance also needs to take into consideration actual execution situations (e.g., delays due to negotiating better prices or constructing effective contract incentives)" (USD AT&L, 2016, p. 118).

There is clearly intention and an attempt to improve these evaluation processes, but implementation has been slow to advance. We must have a properly aligned reward system that can incentivize the PM to reduce costs where available without losing budget authority, and not rewarding the PM who spends more than planned. We must recognize that a plan will certainly change from time to time for good reasons, which can result in obligation rates lagging behind the original schedule. We recommend continuing the effort to restructure the evaluation process and for Congress and DOD to work together and incorporate guidance and policy regulation so that PMs can start saving the taxpayers money without being penalized or having their budget authority revoked.

We have established that the OMA budget authority for the operation and sustainment phase is misaligned. Having the PM as the TLCSM is assigning responsibility, but not providing the resources, such as OMA funding and personnel, to accomplish the responsibility. One PEO program manager comment received from a 2005 RAND study explains TLCSM this way, "The PM as Total Life-Cycle System Manager will not happen until the mission is no longer fragmented between disparate commands, and funding is consolidated with the PM or accountable manager" (Hanks, 2005, p. 54). General Tuttle wrote about funding alignment issues concerning TLCSM in

his book, Defense Logistics for the 21st Century; "Arranging funding is key to the success of implementation" (Tuttle, 2013). He also describes TLCSM as, "The concept of 'responsibility' is empty of meaning unless the PMs are given the same kind of resources and authority for the many facets of life-cycle support that they already have for development and acquisition" (Tuttle, 2013). Tuttle further describes the current funding situation as, "Without funding, PMs have no real authority to influence the course of life cycle support. It is hard to see how the PMs can be accountable for any results or achieve the objectives of the DOD policy change" (Tuttle, 2013). If the PM is to maintain the responsibility of TLCSM, then resources including logistic personnel and OMA funding must be realigned to the PM.

As mentioned earlier, the PM does not receive the OMA budget authority. This lack of control hinders their capability to oversee the O&S phase of the defense system. Placing limitations on those OMA funds, only proves to further bound the ability of the PM to make timely purchases and cause delays in getting equipment to the user.

Regarding the expense limitation of $250,000, an example of this limitation would be the purchase of a radome to cover and protect a large antenna. It is imperative that we install the radome before hurricane season begins. The cost estimate in FY16 for the radome was $225K. It's a year later and time to make the purchase and the price is now $255K. We can no longer make this purchase with OMA funds but will have to search for OPA. The misalignment of the OMA funds only further complicates this situation. Now the sustaining command will need to request OPA from the PM, and the PM may or may not have additional funds. If not, the PM will now have to submit a UFR to the Army. Because of this limitation, the antenna is now more susceptible to damage and the radome purchase will likely be delayed.

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V. CONCLUSIONS, RECOMMENDATIONS, SUMMARY AND AREAS FOR FURTHER RESEARCH

A. CONCLUSIONS AND RECOMMENDATIONS

Based on our research, the intent is to have the PM operate as the TLCSM. The PM seems best suited to take the program from initiation to disposal. By having the LCMCs execute the sustainment program with PM oversight, the Program can gain efficiencies by taking advantage of the current structure the LCMC has developed. Although there are many ways to progress the program through the sustainment phase, we suggest the Army continue to use the current process, but put emphasis on the communication between the PM and the LCMC. The communication needs to start as early as possible between the two parties. The LCMC needs to be treated the same way as a test agency. Test agencies are funded at a basic level and execute any efforts above that level on a reimbursable basis. The LCMC would also get funded at a bare bones level and accept reimbursable work based on the program sustainment efforts. The PM will still control all aspects of the program including funding, and the LCMC will execute based on the mission requirements that have been vetted though the PM office.

These recommendations will require a few changes to the current regulations and policies. The first policy to change should be to elaborate the duties of the PM and the LCMC. We were unable to find any regulation or policy that shows a conceptual transition of duties from the PM to the LCMC. A document needs to be issued that will help the transition early in the acquisition cycle.

The second change would be to have all funding responsibilities lie within the Program Office. The current process gives the executing command the responsibility to plan, program and justify the funds needed for their programs. The LCMC should know what is necessary to maintain their fielded system, but the expertise of the PM could help with efficiency. PMs would view the sustainment phase as the last phase of their responsibility. By having the PM handle all financial aspects of the sustainment phase, it maintains the PM ownership through the sustainment phase.

The third change would be to identify the LCMC as part of the milestone B decision. This change should also mandate LCMC matrix personnel into the Program Office early in the process. The LCMC will be able to identify problems early and suggest the proper changes to the PM and allow the institutional knowledge to continue once the LCMC is executing the sustainment phase.

The final change we suggest making would require a Congressional change. We recommend Congress remove the $250,000 threshold for determining an expense vs. an investment. The $250,000 threshold seems to be very arbitrary and causes problems for high costs expense items. The only criteria that should be used to determine expense vs. investment should be whether or not the purchase will be a centrally managed/asset controlled item. Increasing the limitation will only temporarily relieve the problem until it is determined that the limitation is not feasible. This was the case when the 109th Congress increased the limit in the 2007 DOD Appropriations Act (120 Stat. 1280) to $250,000 from the previous limitation of $100,000." PMs should be able to coordinate with their sustaining commands to manage OMA funds and support operation and maintenance on their respective systems without being limited by the expense vs. investment threshold. This threshold has caused fiscal violations and questionable decisions have been made due to this regulation. By eliminating the threshold, the PM or LCMC will determine whether the items being purchased is a centrally managed/asset controlled item and will be able to more freely purchase needed items with less financial barriers.

B. SUMMARY

The purpose of our research was to determine whether the Army PM has true responsibility and authority to be the TLCSM. To conduct our analysis, we used three questions to focus our research. In summary, these questions were (1) should the PM be TLCSM and what are the alternatives; (2) what requirements exist for transitioning systems away from the PM; and (3) are there funding appropriation obstacles that inhibit the PM as TLCSM.

Through an explanation of the roles and responsibilities of the LCMC, we have found there are alternatives to the PM being TLCSM, especially during the sustainment phase. We also found the guidance for transitioning systems away from the PM to be inconsistent, and the very existence of this guidance to be contradictory to the PM being assigned as TLCSM. Regarding funding, our research has shown there to be funding appropriation restrictions that inhibit the application of TLCSM.

Despite inconsistency in TLCSM guidance and policy, our research has shown the PM best suited to act as TLCSM. We have found that in industry comparable strategies to TLCSM are vertical integration and full stacking. Both of these strategies are only applied by corporations when they have sufficient resources (i.e. time, money, knowledge, personnel, etc.) to accomplish this. Similarly, if the goal is for the PM to be TLCSM, Army and DOD guidance and policy must be in alignment, and the PM must be fully resourced to have authority as TLCSM. If the PM lacks the resources TLCSM is not possible.

C. AREAS FOR FURTHER RESEARCH

Below are areas for further research related to our study of the PM as TLCSM:

1. Is ACAT level correlated with TLCSM assignment?

2. How do joint programs (i.e. Army paired with another service) assign TLCSM responsibilities?

3. Have other services (Marines, Navy, Air Force) aligned their guidance and policies to enable the PM to be TLCSM?

4. How is TLCSM applied for special operations?

5. What is the ideal blend of PM and LCMC responsibilities in order to optimize life cycle systems management, regardless of whether there is a "total" life cycle manager?

6. Do DOD enterprise initiatives such as Better Buying Power support the PM as TLCSM?

7. What is the cost savings of having the LCMC support the Program sustainment vs. the original Program Office?

8. Considering how sustainment transition may decrease the PM workforce, what is the economic impact of TLCSM assignment?

9. How does the Army Working Capital Fund assist in sustainment?

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