Calhoun: The NPS Institutional Archive

DSpace Repository

Theses and Dissertations | 1. Thesis and Dissertation Collection, all items

2001-12

Using evolutionary acquisition in the management of major defense acquisition programs

Williams, Marty T.

Monterey, California. Naval Postgraduate School

https://hdl.handle.net/10945/3936

This publication is a work of the U.S. Government as defined in Title 17, United States Code, Section 101. Copyright protection is not available for this work in the United States.

Downloaded from NPS Archive: Calhoun

http://www.nps.edu/library

Calhoun is the Naval Postgraduate School's public access digital repository for research materials and institutional publications created by the NPS community. Calhoun is named for Professor of Mathematics Guy K. Calhoun, NPS's first appointed -- and published -- scholarly author.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

USING EVOLUTIONARY ACQUISITION IN THE MANAGEMENT OF MAJOR DEFENSE ACQUISITION PROGRAMS

by

Marty T. Williams

December 2001

Thesis Advisor: Elliott C. Yoder
Associate Advisor: Keith F. Snider

Approved for public release; distribution is unlimited

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE	Form Approved OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	December 2001	Master's Thesis

4. TITLE AND SUBTITLE: Using Evolutionary Acquisition in the Management of Major Defense Acquisition Programs	5. FUNDING NUMBERS
6. AUTHOR(S) Marty Williams	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A	10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT	12b. DISTRIBUTION CODE
Approved For Public Release; Distribution Is Unlimited	

13. ABSTRACT *(maximum 200 words)*

This thesis analyzes the issues that must be addressed before the Department of Defense (DoD) can successfully utilize the Evolutionary Acquisition (EA) approach in major weapon system programs. Such programs have often taken over 10 years before the user receives a weapon system based on the original mission need. EA is an acquisition reform measure and is intended to reduce fielding time of Major Defense Acquisition Programs (MDAPs) to three to five years or less.

This thesis looks at the historical aspects of EA and analyzes how the traditional and EA approach differ under the DoD acquisition model. Surveys on the subject of EA were completed by DoD acquisition managers and provide the data for this research. These data are used to identify and explore the issues DoD must address to successfully utilize this acquisition approach.

14. SUBJECT TERMS Evolutionary Acquisition, Acquisition Strategy, Traditional Acquisition, Life-cycle Reduction, Major Defense Acquisition Programs	15. NUMBER OF PAGES 107
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500 Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std.39-18

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited

USING EVOLUTIONARY ACQUISITION IN THE MANAGEMENT OF MAJOR DEFENSE ACQUISITION PROGRAMS

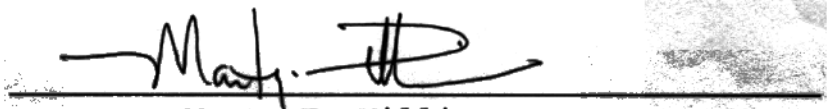
Marty T. Williams
Lieutenant Commander, United States Navy
B.S., Auburn University, 1990

Submitted in partial fulfillment of the
requirements for the degree of

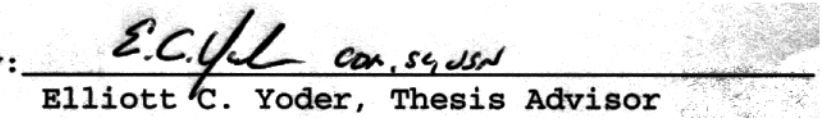
MASTER OF SCIENCE IN MANAGEMENT

from the

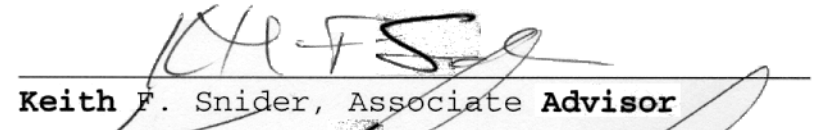
NAVAL POSTGRADUATE SCHOOL
December 2001



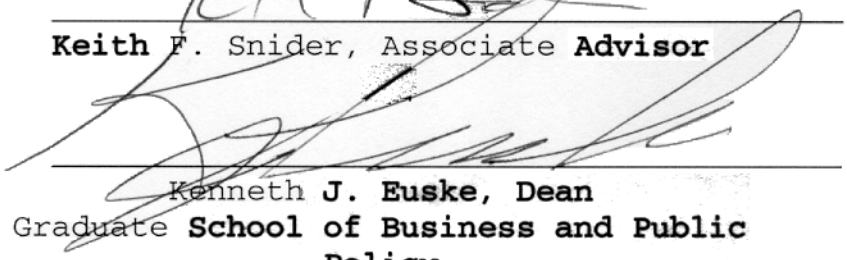
Author: _____
Marty T. Williams



Approved by: _____
Elliott C. Yoder, Thesis Advisor



_____
Keith F. Snider, Associate Advisor



_____
Kenneth J. Euske, Dean
Graduate School of Business and Public Policy

THIS PAGE INTENTIONALLY LEFT BLANK

ABSTRACT

This thesis analyzes the issues that must be addressed before the Department of Defense (DoD) can successfully utilize the Evolutionary Acquisition (EA) approach in major weapon system programs. Such programs have often taken over 10 years before the user receives a weapon system based on the original mission need. EA is an acquisition reform measure and is intended to reduce fielding time of Major Defense Acquisition Programs (MDAPs) to three to five years or less.

This thesis looks at the historical aspects of EA and analyzes how the traditional and EA approach differ under the DoD acquisition model. Surveys on the subject of EA were completed by DoD acquisition managers and provide the data for this research. These data are used to identify and explore the issues DoD must address to successfully utilize this acquisition approach.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

I. INTRODUCTION 1
A. PREFACE 1
B. RESEARCH OBJECTIVE 2
C. RESEARCH QUESTIONS 2
1. Primary Research Question 2
2. Secondary Research Questions 2
D. SCOPE, LIMITATIONS AND ASSUMPTIONS 3
E. METHODOLOGY 3
F. BENEFITS OF RESEARCH 4
G. ORGANIZATION OF STUDY 4

II. HISTORY AND BACKGROUND 7
A. INTRODUCTION 7
B. BACKGROUND AND HISTORY OF THE EA CONCEPT 8
C. THE DOD 5000 ACQUISITION MODEL 11
1. Milestone A (Concept and Technology Development) 13
2. Milestone B (System Development and Demonstration) 15
3. Milestone C (Operations and Support) 16
D. TRADITIONAL APPROACH SHORTCOMINGS 19
1. Increased Cycle Time 19
2. Inability to Handle Rapidly Changing Technology 20
3. Inflexibility to New Requirements 20
4. Lack of User Involvement 20
5. Inflexibility to COTS/NDI Inclusion 20
E. THE EA CONCEPT 21
F. JUSTIFICATION FOR EA 24
G. CHARACTERISTICS OF AN EA MODEL 26
1. A General Description of the Functional Capability Desired for the Full System 26
2. A Concise Statement of Operational Concepts for the Full System 27
3. A Flexible, Well-Planned Overall Architecture, to Include Process for Change, which Will Allow the System to be Designed and Implemented in an Incremental Way with Minimum Regression Testing 27
4. A Plan for Incrementally Achieving the Desired Total Capability which Adheres to Life Cycle Cost Effectiveness 27
5. Early Definition, Funding Development, Testing, Fielding, Supporting and

Operational Evaluation of an Initial Increment of Operational Capability 28
6. Continual Dialogue and Feedback among Users Developer, Supporters and Testers 28
H. COMPARING THE TRADITIONAL APPROACH AND EA CONCEPT 28
I. MISCONCEPTIONS 31
1. EA is Simply an Incremental Acquisition 32
2. EA is Simply a Phased Acquisition 32
3. EA is Simply a Strategy to Avoid Formal Funding Procedures 32
4. EA is Simply a Prototyping Approach 33
5. EA is Simply a Remedy for Poor Requirements . 33
J. CHAPTER SUMMARY 34
III. METHODOLOGY AND DATA PRESENTATION 35
A. INTRODUCTION 35
B. SURVEY METHODOLOGY 35
C. SURVEY RESPONSES 37
1. Competition 38
a. Purpose 38
b. Summary 39
2. The Industrial Base 40
a. Purpose 40
b. Summary 41
3. Risk Management 42
a. Purpose 42
b. Summary 43
4. Acquisition Workforce 44
a. Purpose 44
b. Summary 45
5. Multi-Year Procurement Funding 46
a. Purpose 46
b. Summary 47
6. Market Research 48
a. Purpose 48
b. Summary 50
7. A as a Process Improvement 50
a. Purpose 50
b. Summary 51
8. Issues, Barriers and Concerns 51
a. Purpose 51
b. Summary 53
D. CHAPTER SUMMARY 53
IV. ANALYSIS OF SURVEY RESULTS 55
A. INTRODUCTION 55
B. WHAT ARE THE NEW REQUIREMENTS 55

1. Competition 55
2. Industrial Base 58
3. Risk Management 59
4. Acquisition Workforce 60
a. Multiple Configurations 63
b. Open Systems Architecture 64
c. Total Cost Perspective 64
d. User Understanding 64
e. PPBS Cycle 65
f. Inflated Requirements 65
C. EFFECTS ON THE DEFENSE INDUSTRY 66
1. Industrial Base 66
2. Risk Management 67
3. Issues, Barriers and Concerns 67
D. IS EA A FUNCTIONAL IMPROVEMENT OF THE ACQUISITION PROCESS 67
E. CHAPTER SUMMARY 69

V. CONCLUSIONS AND RECOMMENDATIONS 71
A. INTRODUCTION 71
B. REVIEW OF RESEARCH QUESTIONS 71
C. CONCLUSIONS 76
D. RECOMMENDATIONS 77
E. AREAS FOR FURTHER RESEARCH 78

APPENDIX A. EVOLUTIONARY ACQUISITION SURVEY FOR CONTRACTING PERSONNEL 81

APPENDIX B. EVOLUTIONARY ACQUISITION SURVEYFOR PROGRAM MANAGERS 83

APPENDIX C. LIST OF ACRONYMS 85

LIST OF REFERENCES 87

INITIAL DISTRIBUTION LIST 91

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF FIGURES

Figure 2.1. The DoD 5000 Acquisition Model. 12
Figure 2.2. EA Concept. 23
Figure 2.3. Traditional (Standard) and Evolutionary Approach. 30

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

Table 2.1. Comparisons of the Traditional and EA Approaches. 31
Table 4.1. Will EA Have a Negative Affect on Competition. 39
Table 4.2. Effect EA Will Have on Risk. 43
Table 4.3. Most Important Areas of Risk. 43
Table 4.4. Effects of EA on Workforce Workload. 44
Table 4.5. Will EA Reduce the Number of MYPs. 46
Table 4.6. Role of Market Research under an EA Approach. 49
Table 4.7. Areas Market Research Will Emphasize. 49
Table 4.8. Is EA an Improvement of the Acquisition Process. 50

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

A. PREFACE

On 12 January 1995 Paul G. Kaminski, former Under Secretary of Defense (Acquisition and Technology), cited Evolutionary Acquisition (EA) as an alternate practice to be assessed by program managers when developing the acquisition strategy for individual programs. More recently, the latest revision of the Department of Defense Directive 5000.1, Defense Acquisition System, and Department of Defense Regulation 5000.2-R, Mandatory Procedures of Major Defense Acquisition Programs and Major Automated Information Acquisition Programs, support Mr. Kaminski's memorandum and encourage program managers to continually search for innovative and efficient practices.

These documents present an acquisition process used to manage Major Defense Acquisition Programs (MDAPs) in the Department of Defense (DoD). Under past traditional approaches, the period from which the user generates the requirement until the system is fielded can exceed 10 years. This has resulted in users receiving weapon systems with at least decade old technology to combat threats.

The EA concept is a result of numerous acquisition reform measures to reduce the time it takes to develop and field weapon systems for the war fighter. EA is defined as

> …an approach that fields an operationally useful and supportable capability in as short a time as possible. The approach is particularly useful if software is a key component of the system. EA delivers an initial capability with the explicit intent of delivering improved or updated capabilities in the future. (DoDI 5000.2, 2000, 23)

The EA approach is intended to reduce the time for fielding from over 10 years down to five years or less. Additionally, it is intended to provide the user an initial capability that can be fielded against the original threat and provide follow-on capabilities as they evolve.

B. RESEARCH OBJECTIVE

The EA concept is the object of this research. This study investigates the issues involved for the DoD to successfully transition to an EA process for major weapons procurement. The ultimate goal is to provide contracting officers and program managers insight on issues required to successfully implement EA strategies. This thesis will provide contracting officers and program managers (PM) an understanding of the issues required to successfully transition to an EA approach. An analysis of the issues will provide the reader key insight when developing future acquisition plans and strategies.

C. RESEARCH QUESTIONS

1. Primary Research Question

- What issues must be addressed to allow the Department of Defense to successfully utilize an Evolutionary Acquisition approach?

2. Secondary Research Questions

- What is the background and history of Evolutionary Acquisition?
- What new requirements does this acquisition approach place on the Department of Defense?
- What are the possible effects of this new acquisition approach on the defense industry?
- Is Evolutionary Acquisition a functional improvement of the acquisition process?

D. SCOPE, LIMITATIONS AND ASSUMPTIONS

This research is limited to analysis of EA for MDAPs and the issues that must be addressed when this approach is used. The focus is on strategic issues associated with EA rather than specific details. The emphasis is on identification of issues from major participants in acquisition, specifically PMs and contracting officers.

While there may be similarities between EA and block upgrades under the traditional approach, in this study each approach is viewed as a distinct acquisition strategy.

This research is limited by the availability of purely EA programs to analyze. This research has not identified any programs that have used the EA approach or concept from the beginning to end. (Throughout this research the terms approach and concept will be used interchangeably.) Consequently, the study relies on opinions, beliefs, and experiences of acquisition professionals who may have differing ideas on EA.

E. METHODOLOGY

The methodology used in this research consisted of three primary areas: a literature search, a qualitative survey and follow-up telephone interviews. The literature research traces the background and history of EA and provides the reader a greater understanding of the benefits of an EA approach to major weapon system procurement.

The qualitative survey was aimed at gaining an understanding of the issues contracting and program management personnel feel are important with respect to EA. The results, in turn, may provide guidance on how users will employ EA in day-to-day use. Survey input was received from contracting and program management personnel

from the various defense departments and members of the Science and Technology community. The survey was distributed electronically to facilitate quick responses. A sample of the survey distributed is provided in Appendices A and B. Follow-up telephone interviews are conducted with survey respondents to clarify responses.

F. BENEFITS OF RESEARCH

This thesis is primarily intended to benefit DoD acquisition personnel who specialize in major weapon systems procurement. This review will facilitate DoD acquisition guidance on many of the issues, benefits and concerns associated with using EA as an acquisition strategy.

G. ORGANIZATION OF STUDY

Chapter I provides an introduction, the objective of the research, the primary and secondary research questions, the methods by which research data was collected, the scope, limitations and assumptions of the thesis research, the benefits of the research and organization of the study.

Chapter II introduces the EA process by providing an historical background of the concept. The chapter then documents the traditional acquisition process and addresses shortcomings with this approach. The next section examines the EA concept, the justification for using EA methods, and the characteristics distinctive to the concept. The chapter then provides a detailed comparison of the two acquisition approaches and concludes with misconceptions associated with the EA approach.

Chapter III provides an overview of the data collected. Additionally, it presents survey and follow-up interview data with respect to the core competencies of

contracting and program management. The chapter concludes by discussing EA as an improvement process, and identifies the potential issues, barriers and concerns for this approach.

Chapter IV discusses and analyzes survey data using the primary and secondary research questions as a basis for discussion. The chapter first looks at respondents' issues and concerns regarding EA's effect on DoD and the Defense industry. The chapter concludes by addressing the issues survey respondents believe are important under an EA approach.

Chapter V presents the conclusions and recommendations generated by this research. It also provides areas of further research on the topic of EA.

THIS PAGE INTENTIONALLY LEFT BLANK

II. HISTORY AND BACKGROUND

A. INTRODUCTION

Existing Office of Management and Budget (OMB) and Office of the Secretary of Defense (OSD) policy statements have provided a basis for formalizing the acquisition processes used within the DoD. OMB Circular A-109 identified seven "Major System Acquisition Objectives". One of these objectives is to

> …tailor an acquisition strategy for each program, as soon as an agency decides to solicit alternative system design concepts, that could lead to the acquisition of a new major system and refine the strategy as the program proceeds through the acquisition process. (OMB A-109, 1996, 3)

This OMB objective emphasizes the desire to develop a unique strategy for each program. EA as a concept appears to support this policy statement. As defined in Chapter I, DoDI 5000.2 states EA will "deliver an initial capability with the explicit intent of delivering improved or updated capabilities in the future." (DoDI 5000.2, 2000, 23) While efforts toward acquisition reform have led to EA becoming the "preferred approach to satisfying operational needs", (DoDD 5000.1, 2000, 4) there is need to understand the differences between the traditional and EA approach.

This chapter presents a brief history of the EA concept to show how the concept has progressed to its current stature. Next, the chapter will address the perceived shortcomings of the traditional approach, introduce the EA concept, and provide characteristics that will assist acquisition managers in identifying candidates for EA programs. The chapter then compares the traditional

and EA approaches and concludes by highlighting misconceptions concerning the EA approach.

B. BACKGROUND AND HISTORY OF THE EA CONCEPT

"The EA concept has been in existence in commercial applications since the mid-1970s." (USAF EA Guide, 2000, 1) It was first introduced in the military as a concept in 1987 as a future development in the Joint Logistics Commanders Guide (JLCG). Since then the advance of Information Technology (IT) and rapid improvements in the performance of computer hardware have led to the availability of computer based, software intensive weapon systems with unprecedented power and range of capabilities. These systems are so complex, and their technologies are changing so rapidly, that the users have great difficulty in specifying many of their detailed needs. Advancing technology challenged the DoD traditional acquisition strategy, resulting in significantly extended acquisition programs. Without the ability to evolve, the traditional acquisition strategy forced the war fighter to wait 10 years or more for a weapon system that may be both obsolete and unable to counter the intended threat.

Consequently, advances in technology are not easily incorporated into weapon systems when the advances are achieved after the development stage of the acquisition process. This results in weapon systems that fail to meet the user's expectations, cost too much and take too long to develop. Brigadier General Hirsch, U.S. Army (ret), a professor at the Defense Systems Management College (DSMC), describes this relationship between user and developer as follows.

> Commanders will present the requirements to the developers on a continuing basis as they evolve. Initial and subsequent increments of operational capability will be defined, refined, funded, developed, tested and fielded with continual input from and evaluation by the user. Neither the user nor the developer can state now with certainty and engineering specificity what one needs and the other can produce. Throughout an acquisition process the user will continually stress that the latest technology is incorporated to provide the greatest advantage over the enemy. (Hirsch, 1985, 39)

EA is an alternate approach, which by definition has the capability to evolve with technology while giving the user capabilities along the way.

Years of existence in the commercial market place and its recent incorporation into the DoD procurement process have shown that EA has not been a popular choice among program or project managers. That EA has not been more widely used reflects the concern of those who approve and fund acquisition strategies.

> There is concern that EA and similar strategies are inherently risky. Failures in recent years in the development of complex systems by traditional strategies have led to the painful realization that these strategies also involve significant risks for certain types of projects. The implication is clear: to acquire the systems we need, we need to adopt more responsive and iterative strategies, and we need to accept and understand risks and control them. (Henderson and Gabb, 1997, 2)

Eighteen years ago, the United States debated the utility of a space-based defense system – the Strategic Defense Initiative (SDI). An important part of the debate was how to ensure command and control (C2) systems were upgraded as technology advanced.

> Generally, technology advances create new capabilities never imagined. In the realm of software technology, where life cycles are dramatically shorter than they are for hardware, the technology that emerges from a fifteen-year development program will indeed be obsolete. The SDI was based on a traditional acquisition approach and although it failed for several reasons, one of the main reasons was the user and developer expectations were not in line. (Cohen, 1997, 67)

To provide guidance to the use of an EA strategy, DSMC published in March 1987, the Joint Logistics Commanders Guide for the Use of and Evolutionary Acquisition (EA) Strategy in Acquiring Command and Control (C2) Systems. The guidance relied on the two major studies of past acquisitions of C2 systems and "found that the use of conventional approaches to acquisition of such systems has led to unsatisfactory results." (JLCG, 1987, 3) The systems considered in these studies were large, software-dominated systems.

DSMC then recognized that technology was becoming an increasingly important factor in weapon systems and revised its 1987 guidance. In 1995, it published the Joint Logistics Commanders Guide for Use of Evolutionary Acquisition Strategy to Acquire Weapon Systems. According to DSMC

> Studies currently underway have examined the acquisition environment likely to emerge from the changed threat perception, rapid world economic change and its associated technological advancements and realignments. It appears that rapid change to most elements that affect the acquisition process environment will preclude those long periods of stability necessary to develop clear definition of system operational concepts, capabilities, and functions prior to

> entering EMD. This implies the extension of EA processes to systems other than C3I. (JLCG, 1995, 2-1)

In 1998, DSMC further revised its guidance to support Defense Secretary Cohen's "Joint Vision 2010". The Joint Vision 2010 states, "America's armed forces will channel the vitality and innovation of our people and leverage technological opportunities to achieve new levels of effectiveness in joint military operations." (QDR, 1997, Sec. VII) To support Secretary Cohen's direction, DSMC made minor changes to the JLCG to make it more responsive to current and anticipated threats in 2010. According to DSMC

> The EA philosophy and implementation instructions have withstood the test of time. The processes described in this reissue of the 1995 document retain their utility today. The EA concept is no longer simply a viable optional methodology for acquiring new weapon systems. (JLCG, 1998, ix)

The above explanation indicates that, as technology evolves, more complex systems require a different acquisition approach. Finally, in October 2000, Deputy Defense Secretary, Rudy de Leon, approved the EA approach and made it "the preferred approach to satisfying operational needs." (DoDD 5000.1, 2000, 4)

C. THE DOD 5000 ACQUISITION MODEL

The DoD 5000 model (depicted below in figure 2.1) is explained here to enhance the understanding of the acquisition process and provide a basis for clarifying the difference between the traditional approach and EA concept in later sections. The process of the DoD 5000 model is paraphrased below and based on researcher notes from an acquisition class taken at Naval Postgraduate School and

DoDR 5000.2-R. The acquisition class was titled "Contracting for Major Systems".

Before an acquisition program is established, the requirement and ultimately the mission need must be developed through the requirements generation process. In weapon systems acquisition, the major Commanders in Chiefs (CINCs) identify their requirements based on the National Military Strategy. The National Military Strategy is derived from the President's National Security Strategy and provides the level of military power and presence the Secretary of Defense is tasked with providing.

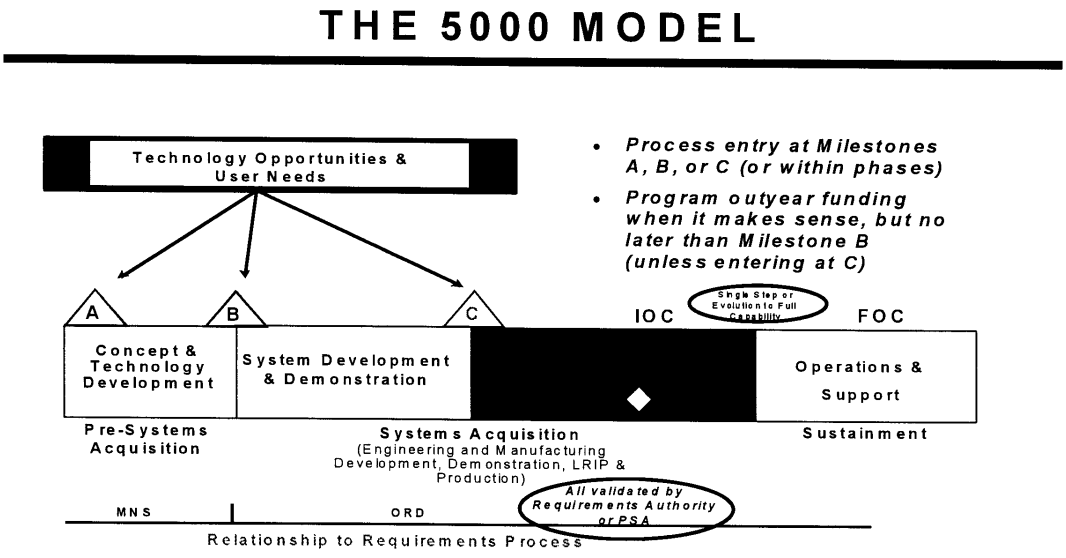


Figure 2.1. The DoD 5000 Acquisition Model. (Source: DoDI 5000.2)

Within the U.S. Navy, the Office of the Chief of Naval Operations (CNO) consolidates the CINCs requirements and develops a Mission Need Statement (MNS). The MNS is, in turn, revalidated by the CINCs to verify it meets their objectives and those of the National Military Strategy.

The CNO tasks a major Systems Commands to develop a solution for this specific mission need. It must be understood that not all requirements are converted into acquisition programs. Some user needs can be filled with non-material requirements.

> The non-material needs are given to the user for resolution, and are generally met with changes in doctrine, tactics, training, organization, etc. Material needs can ultimately be met by modifying existing equipment or through buying a new system. In either case, material needs are defined in a draft mission need statement. [Keller, 1996, V-14]

The graphical representation in Figure 2.1 shows the framework of the acquisition model is divided into three milestones. Each milestone is further divided into phases that identify specific work efforts. The section below provides a broad overview of the three milestones and the phase components.

1. Milestone A (Concept and Technology Development)

Before a Milestone A decision is made, the requirements authority must both validate and approve the MNS. Once completed, the Milestone Decision Authority (MDA) reviews the MNS for issues related to technology and identifies possible alternatives. A thorough analysis of alternatives is completed and a decision is made to enter Milestone A. It must be understood that a favorable decision does not mean a new acquisition program has been initiated. It means the entrance criteria for Milestone A have been achieved.

At Milestone A, the MDA is required to approve the initiation of concept studies, approved exit criteria for concept exploration and issue an Acquisition Decision

Memorandum (ADM). Beginning here and throughout the acquisition process, Integrated Product Teams (IPT) are used extensively in developing an evaluation strategy for the MNS and milestone exit criteria. The phase components that support this milestone are Concept Exploration and Component Advanced Development. Concept Exploration consists primarily of paper studies of alternative concepts that may meet a specific mission need. The alternative concepts are developed through innovative and competitive studies from the private and public (Office of Naval Research, Center of Naval Analysis, other federally funded research and development centers, educational centers and non-profit organizations) Science and Technology (S&T) community. Promising concepts are evaluated for risk, cost, schedule, performance and other key management requirements.

At this point the MDA conducts a decision review to determine if additional component development is required. A further development decision requires the concept(s) to progress to Component Advanced Development. Herein, additional contracts and studies are conducted to further reduce risk at the system and subsystem levels. Work efforts are guided by the MNS but an Operational Requirements Document (ORD) is developed to support program initiation. Efforts here are followed by a MDA Milestone B decision review. The Milestone B decision review consists of an acquisition strategy, a program protection plan and other key management tools to support program initiation. Most Major Defense Acquisition Programs (MDAPs) are initiated at Milestone B, thus a favorable decision review initiates the beginning of an acquisition program.

If technology is mature, the Milestone B decision review can occur after the Concept Exploration phase or after the Component Advanced Development phase when additional development is complete.

2. Milestone B (System Development and Demonstration)

With exit criteria from Milestone A achieved, a program is initiated and enters Milestone B. This milestone has two phases, System Integration and System Demonstration, separated by an Interim Progress Review. The program acquisition strategy is now defined for both this milestone and future full capability. The PM and acquisition executives now determine if an evolutionary or traditional acquisition approach is warranted. The approach to follow depends on the time-phased requirements of the ORD, maturity of technology, relative costs and benefits for progressing the program in evolutionary blocks versus a traditional single step. Unless other overriding factors are present, technology maturity dominates the decision in choosing an approach.

The objective of Milestone B is to develop concepts into producible and deployable products that provide capability to the user. Accomplishment of this objective coincides with program risk reduction, supportability, affordability, system integration, interoperability and utility.

Technology is developed in the S&T community or procured from private industry. Milestone B approval can lead to System Integration or System Demonstration. Hardware-intensive systems generally move from one phase to the next while software-intensive systems combine both

phases into a build-test-fix-test-deploy process. In either case, the program will enter System Integration when the PM has a system's architecture, but has not yet integrated the subsystems to make a complete system. The program will exit System Integration when integration of the system has been demonstrated in a relevant environment. Demonstration is conducted using prototypes to integrate subsystems and reduce risk. Once complete, an Interim Program Review is conducted by the MDA to determine if the program is progressing or needs adjustment. A successful review enters the program into the next phase.

With the prototype articles demonstrated, the program enters the System Demonstration phase. This phase ends when a system is demonstrated in its intended environment, using engineering development models or integrated commercial items; meets validated requirements; establishes industrial capabilities are reasonably available; and receives MDA approval. Accordingly, the program must simultaneously meet or exceed exit criteria and Milestone C entrance criteria. Modeling and simulation is the preferred demonstration method when a proven capability exists.

3. Milestone C (Operations and Support)

Milestone C entrance criteria are mature technology, an approved ORD, acceptable interoperability, acceptable operational supportability, demonstrated system affordability, acceptable information assurances and anti-tamper provisions. The MDA shall confirm the acquisition strategy is approved prior to release of the final Request for Proposal and approve an updated acquisition program baseline, low-rate initial production (LRIP) exit criteria

and the acquisition decision memorandum. The purpose of this milestone is authorized entry into LRIP or limited deployment for MDAPs.

The LRIP decision is intended to result in development of an adequate and efficient manufacturing capability while minimizing the production quantity necessary to conduct proper initial testing and evaluation (IOT&E). The Director, Operational Test and Evaluation (DOT&E) and cognizant OIPT Leader approve the Test and Evaluation Master Plan (TEMP) used to evaluate the system in a fielded operational environment. Successful testing from IOT&E community is followed by a MDA full-rate production decision review. A successful review, combined with proper reporting to Congress, Secretary of Defense and USD (AT&L), results in full-rate production and deployment.

Fielded systems must be supported by adequate logistics and support elements. The Sustainment phase provides the readiness and operational support capabilities necessary to maintain the system through its useful life. The Sustainment phase will incorporate and support follow-on operational testing, system upgrades, interoperability, and survivability issues.

At the end of its useful life, a system must be demilitarized and disposed of. The PMs acquisition strategy addresses demilitarization and disposal requirements. Specifically, the Disposal phase exists so that removal of the system from service is carried out in accordance with legal and regulatory requirements.

Variations of this milestone process are numerous but the basics of the acquisition process are described herein.

OMB A-109 describes these steps/milestones as an iterative process.

> As more knowledge of needs, alternatives solutions, actual capabilities, resource and priorities are acquired, some steps in the overall major systems cycle may be iterated, as necessary, to permit decisions to be made in a total system context. (Henderson and Gabb, 1997, 5]

Throughout the process, the program manager (PM) must communicate how the steps of the acquisition process are to be conducted, given the resources and constraints the program is subject to. Contracting personnel, industry, logisticians, testers, engineers, CINCs, other users and Congress are just a few of the players involved. All must understand the plan is to produce the system within budget, and on time while, meeting the user's requirements as defined in the ORD. The acquisition strategy communicates necessary information to all concerned, allowing them to plan and support the PM's goals. The DSMC defines an acquisition strategy as

> A business and technical management approach designed to achieve program objectives with in specified resource constraints. It is the framework for planning, organizing, staffing, coordinating, and leading a program. It provides a master schedule for research, development, test, production, fielding and other activities essential for program success and for formulating functional strategies and plans. (DSMC Acquisition Strategy Guide, 1999, 1-1)

The acquisition strategy incorporates milestones and other reviews throughout the process to define points in the acquisition process that are critical for the successful eventual fielding of a program. According to the Defense Acquisition Deskbook

> Phases and other decision points facilitate the orderly transition of broadly stated needs into system-specific performance requirements and a stable design that can be produced efficiently. They provide the context within which a system is designed, developed, and deployed during its life cycle. (DAD, 2000)

While use of the DoD-5000 model is required, the acquisition process itself is not defined by it. Every acquisition is unique. Program Managers must assess each program individually to determine where in the acquisition model the program commences. The goal of acquisition executives and PMs must be to "ensure each acquisition strategy incorporates common sense, sound business practices, applicable laws and regulations and the time-sensitive nature of the user's requirement." (DoDD 5000.1, 2000, 6)

D. TRADITIONAL APPROACH SHORTCOMINGS

The current DoD 5000 model was developed in response to a traditional way of managing programs. In the past a more lockstep or inflexible approach to program management was the norm. It is possible to successfully manage a program using the traditional approach but based on its inflexible nature there are many shortcomings. The purpose of this section is to highlight these shortcomings and provide a picture to show the distinctions between the traditional and EA approaches. Based on this perspective, the researcher has identified several perceived shortcomings of the traditional model.

1. Increased Cycle Time

"The average cycle time for MDAPs since 1960 has been 132 months or 11 years." (Johnson, 1999, 8) Systems that

require reduced cycle time are challenged by the traditional approach.

2. Inability to Handle Rapidly Changing Technology

Systems that are incorporate rapid changing technology are difficult to upgrade and maintain. "Traditional acquisition models often result in the delivery of systems with obsolescent computer hardware, due to the high speed of computer technology." (Henderson and Gabb, 1997, 11)

3. Inflexibility to New Requirements

"The PM needs a process that accepts and encourages evolutionary practices." (Axiotis, 2000, 1) Axiotis states in this article that an evolutionary process is required because the traditional process relies on clearly defined end-states and cannot adjust for new or changing requirements.

4. Lack of User Involvement

As discussed in the DoD 5000 model above, user involvement is primarily at the beginning and end of the program. When the traditional approach is used to manage a program user involvement remains low. Because the traditional approach can take 10 years or more, this lack of user interface can create confusion and lack of information flow between the user and program office.

5. Inflexibility to COTS/NDI Inclusion

"The objective is to infuse upgrades into our system, which are not fundamental performance upgrades, without painting them as new-start acquisitions." (Axiotis, 2000, 2) Axiotis believes the traditional approach is inflexible to COTS/NDI inclusion beyond Milestone C of the DoD 5000 model. From an OT&E perspective, this lack of flexibility leads to longer and more complex operational tests." (Axiotis, 2000, 2)

E. THE EA CONCEPT

Based on a detailed literature review and conversations with contracting and program management personnel, this researcher has found no programs in DoD that have totally incorporated EA concepts throughout the program life cycle. Many programs may reflect some aspects of EA, but a pure EA program is currently only an ideal.

The process flow of the EA concept follows that of the 5000 model. Like the traditional approach, each EA concept should follow the milestones/phase methodology. The major difference is that, internally, the EA concept contains several traditional acquisitions that outline requirements from the core (initial) through the final capability.

Figure 2.2 depicts the EA concept with focus on the ORD. As discussed in the DoD 5000 model, the ORD is developed in the later part of Milestone A, the same is true for the EA concept. Each incremental ORD requires an acquisition strategy, a program protection plan and other key management tools to support the incremental ORD. A successful Milestone Decision Review allows the incremental ORD to enter Milestone B and continue as the model depicts. Once the program is complete, the next incremental ORD is introduced and the process repeats until the final capability is achieved. Occasions can occur for incremental ORD development to overlap. The Air Force Evolutionary Acquisition Guide provides a basis for discussing the EA concept in Figure 2.2.

The incremental ORDs represent all requirements, KPPs and other performance parameters, from the core through the final capability. The core is the initial agreed upon set of requirements to be delivered first and provides a useful

and supportable capability. According to the figure the core is: “Core = KPP(T1)+ KPP(T2) + … O(1) + O(2)…”. This terminology means the first two KPPs and other performance parameters are achieved in the core capability.

The increments represent the agreed upon incremental deliveries of additional capabilities. There can be several increments, the number of increments depends upon evolving requirements, evolving technology and funding availability. According to the figure the first increment is: “I(1) = KPP(T3) + KPP (T4) … + O(3) + O(4) …”. This terminology means the first increment will incorporate KPPs and other performance parameters 3 and 4.

These equations show a typical example of how the requirements can be spread between the core and incremental capabilities. The KPPs within each increment are generally successive and build upon the previous increment while other performance parameters may be addressed in a different sequence.

The timeline could represent a potential development and delivery schedule for the EA concept. For example, Increment I(1) could be initiated when the requirements are defined and stable funding is available. In the majority of cases, because the I(1) capability is dependent on the core it will not follow until the KPPs from the core are achieved. The extensive overlap of the core and increments in Figure 2.2 is not intended to depict that follow-in increments are developed before the previous increment is complete. Generally, this is not the case.

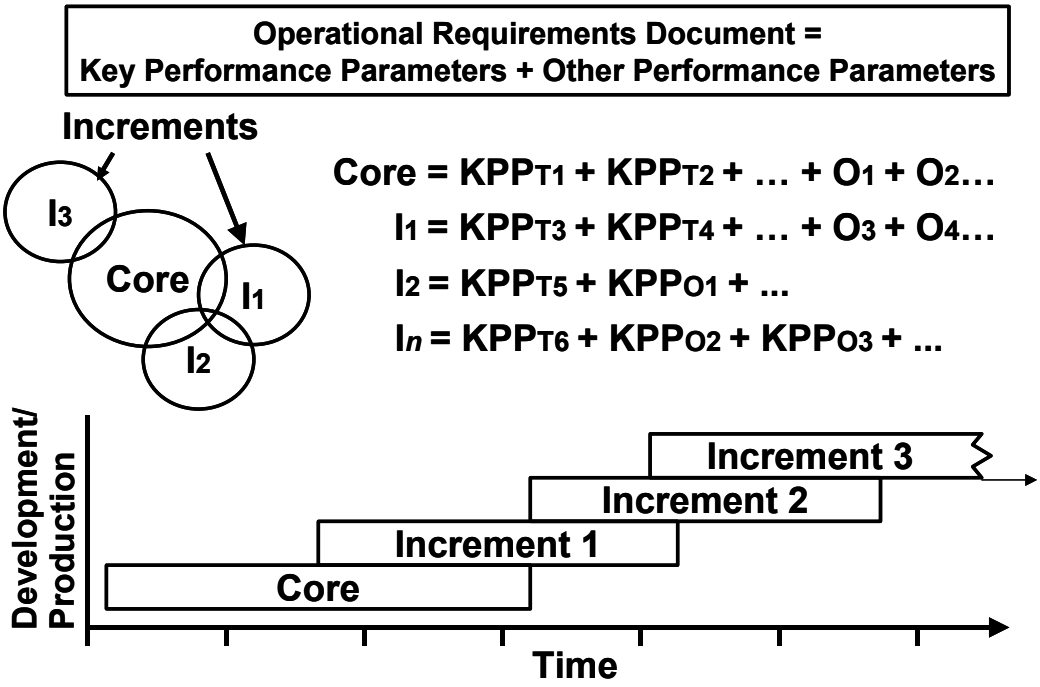


Figure 2.2. EA Concept.
(Source: Air Force EA Guide)

A basis for DoD moving to this EA concept is supported by Secretary Cohen's direction for the innovation of people and leveraging of technology. The EA concept should support this measure because it intends to improve the acquisition process by reducing cycle time, providing initial capability sooner and upgrading technology in the future.

Some successful management practices from recent military developments have been drawn upon to help define characteristics of the EA concept:

> F-117 Tactical Fighter – This program has become a hallmark of successful acquisition practice. During a brief period in the 1980s, this highly advanced system was developed and fielded as a 59 aircraft wing, typical of smaller battle group deployments likely in the future. The development for fielding was very short; non-

value technical, management and financial reporting was excluded; and long-term financial stability was emphasized to avoid year-to-year incremental funding disruption.

Theater High Altitude Air Defense (THAAD) System – THAAD uses DOD-5000 phasing in a relatively positive way. During Phase I, an initial missile defense capability to combat today's basic threats is fielded for user operational evaluation. Phase II is to develop system upgrades for expanded capability. THAAD's strategy is important because it breaks away from the traditional process for basic fielding and shortens development cycle time.

X-31 Aircraft – This cooperative effort between the U.S. and Germany used bare bones funding, contract tasking and solid teamwork to fashion the first new X-Model program in decades. I was managed using approved contractor plans and, much like the F-117, it uses existing subsystems in areas not critical to its advanced combat aerodynamics. (NCAT, 1996, 4-5)

Lessons from the above acquisitions and many others laid the groundwork and policy basis for creating the EA concept. The results of these lessons helped in determining characteristics for using the EA concept. These characteristics are discussed in section G.

F. JUSTIFICATION FOR EA

A justification for using the EA concept as an improvement process can be characterized by Harrington's text, Business Process Improvement (BPI). He states three main objectives of the improvement process: "making process effective, making processes efficient, and making processes adaptable. These objectives are paraphrased with supporting issues:

Step 1: Making Processes Effective – producing the desired result.

With full support and stable funding, EA can be an outstanding method of providing the user an interim capability and full capability later. The major drawback with the traditional approach is that life cycle timeframes exceed 10 years. Based on EA methods the user should receive some level of capability, generally, within three to five years. If EA can maintain full support and funding, by design it should be a more effective process.

Step 2: Making Processes Efficient – minimizing resources used.

By design, the EA concept should be most effective when it is used on large software intensive systems that require some range of human interaction. The incremental nature of EA should allow the concept to take advantage of commercial NDI's and dual-use technologies. If this is the case, the commercial market should set the price and allow DoD to use less DoD specific resources.

There is concern that the follow-on increments in route to full capability will produce a burden on configuration management and ultimately increase life cycle costs. The open systems approach has been used with success under the traditional approach for some time. There will be multiple configurations under an EA approach, however, there should be an efficient transition to full capability if the system is truly open. Significant cost may be an attribute in the short-run, but with support and stable funding the long-term benefits should relate to lower cost.

Step 3: Making processes adaptable – being able to adapt to changing user needs

The basic structure of EA is evolving technology that is designed to meet the user's needs in as short of a period as possible. Throughout the evolutionary process the ORD is re-validated to ensure program direction meets the needs of the user. Specific capabilities are based on the perceived threat outlined by the CINCs and the National Military Strategy. An argument can be made that EA is an adaptable process and it meets the changing needs of the user.

G. CHARACTERISTICS OF AN EA MODEL

Just as in the traditional approach, EA is a challenging process that requires dedication to the process from initial through final capability. Because every program acquisition is not suitable for EA, it is necessary to identify characteristics that are appropriate to the EA concept. The Joint Logistics Commanders Guide describes six characteristics of an EA model. These characteristics are identified with supporting comments below:

1. A General Description of the Functional Capability Desired for the Full System

This broad description of the system must be known before design and development are started. As much as possible requirements must bound and not allowed to move outside the functional capabilities identified. An example of this is the phasing aspect of the THAAD system. The phase aspect allows the PM to provide an initial capability for the short term and identify the full capability in the follow-on phase(s). This phased approach provides a general description of what the user requested in the original MNS.

2. A Concise Statement of Operational Concepts for the Full System

There must be detailed information about the minimal operational aspects of the system and preferably some of the early increments should be defined. All operational aspects must be refined as early in the program as possible. The THAAD system is an example for the same reasoning identified.

3. A Flexible, Well-Planned Overall Architecture, to Include Process for Change, which Will Allow the System to be Designed and Implemented in an Incremental Way with Minimum Regression Testing

The system architecture must have the capability to support the incremental functions that are delivered with each release. This includes those functions for which detail requirements have not been defined. The system architecture must be flexible, scalable and maintainable. The F-117 is an example of this characteristic because it emphasized long-term financial stability. This allowed the program to progress incrementally and minimize regression.

4. A Plan for Incrementally Achieving the Desired Total Capability which Adheres to Life Cycle Cost Effectiveness

Programs should be divided in various phases and increments. Each increment will result in the development of functions that enhance and increase the overall capability of the system. Each increment may involve mini acquisition within that may encompass the various milestones and phases of an EA strategy. An example of this is the upgrade of the Navy Tactical Command Support System (NTCSS). This program attained life cycle cost effectiveness through an ambitious installation schedule. “The program achieved cost avoidance of $753.3M and a

productivity benefit of $744.1M over the program 15-year life cycle." (www.acq-ref.navy.mil, 2001)

5. Early Definition, Funding Development, Testing, Fielding, Supporting and Operational Evaluation of an Initial Increment of Operational Capability

As soon as possible, contracts for the first phase, the minimal system, plus any additional increments must awarded. The capabilities and funding levels needed for further increments must be addressed separately. Determinations must be made during each increment if competition can be achieved or the same supplier will be used. No specific example is available because this research has not found a program that used EA fully from the initial concept through to fielding.

6. Continual Dialogue and Feedback among Users Developer, Supporters and Testers

There must be dedication by all involved in the process to ensure requirements are continually reviewed. Specifically, users can provide critical data about early increments being used in an operational environment. The Navy Battle Force Tactical Trainer (BFTT) Electronic Warfare Trainer (BEWT) supports this characteristic. "In addition to early teaming with the customer, BEWT acquisition established of an Integrated Logistics Support (ILS) arm, and a BEWT Support Office (BFSO)." (ACQN Reform Website)

H. COMPARING THE TRADITIONAL APPROACH AND EA CONCEPT

The traditional acquisition approach is the framework that has guided the development of weapon systems from concept exploration to fielding. OMB A-109 and subsequent DOD instructions emphasize tailored approaches and do not preclude the use of commercial technology and best business practices. The above examples are unique in that they

follow this guidance and show how acquisition managers manage risk (cost, performance, schedule) so that programs can progress forward. Although these successes are based on the traditional approach, there was extensive use of long-term financial support, incremental capability, and life-cycle reductions. In this section, we will look at traditional and EA procurement approaches. Figure 3.1 outlines these two models and highlights from a broad perspective their differences.

The figure specifically addresses the level of user insight. Users are defined as the major CINCs and Type Commanders (TYCOMS). Under the traditional approach, the level of user insight begins fairly high but falls off until the integration and testing phase. With user involvement being limited to the beginning and end of the process, changes under the EA approach are more difficult to make. As outlined in the figure, this model is not appropriate for unprecedented systems and systems in a changing environment.

Unlike the traditional approach, the EA approach is dynamic and provides capability to the users in varying increments or stages. The EA approach provides an integrated process that allows users, developers and PMs to interface and validate the status of the program from fielding of the initial to the final capability. Because the user is continually involved, adjustments to the core requirements are fairly straightforward. The major drawback to this approach is uncertainty. Constantly improving and developing technology creates difficulty in ascertaining risk associated with cost or schedule. In short,

technology is both the benefit and weakness of the EA approach.

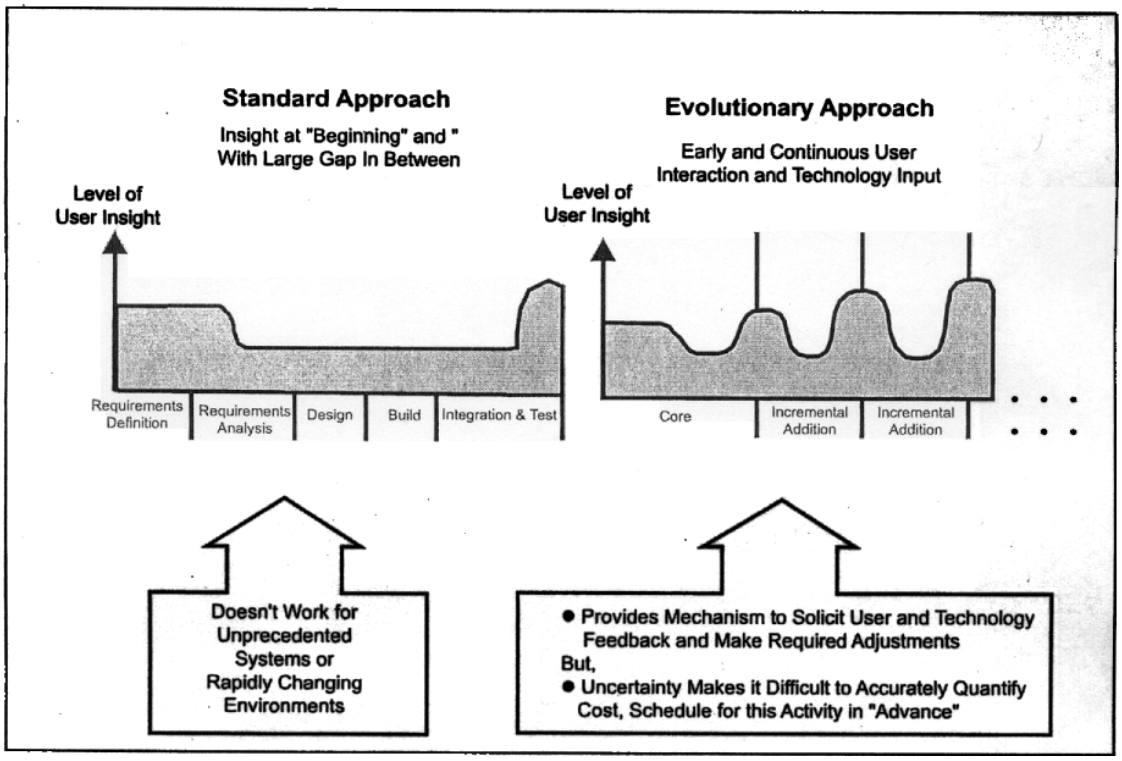


Figure 2.3. Traditional (Standard) and Evolutionary Approach.
(Source: DSMC Acquisition Strategy Guide)

To fully show the differences in the two approaches, the researcher provides a breakdown by category of each model. Table 3.1 below outlines eight major issues that are distinctive to either acquisition approach. The comparison is for a “typical” program initiated from the requirements generation process through fielding.

	Traditional Acquisition	Evolutionary Acquisition
Requirements	Requirements are known at the start and remain stable throughout the program.	Requirements are broadly defined. They evolve and are refined as the program develops.
Design/Technology	Determined Early in the Program or when mature.	The basic architecture and initial functions are determined early, but the detailed designs and other functions evolve. Cutting edge but fully tested.
Acquisition Methods	Acquisition methods occur sequentially.	Acquisition methods occur repetitively and concurrently.
Delivery	Single Delivery	Phased or Incremental Delivery
Contract Competition	One or one set of competitive proposals. Winner awarded the entire system contract.	One or one set of competitive proposals for the Phase/Increment I contract. Follow on phase/increments may or may not be competed individually.
Acquisition Cost	Known based an awarded contract. Capped based on contract type.	Known based on the Phase I contract. Follow-on phases are estimated and capped.
User Involvement	Relatively Low	User involvement essential and is required to determine future phase requirements.
Risk	Performance: Higher because of the single step approach. One chance at success. Management: Lower because requirements are stable. Cost: Lower because technology is mature.	Performance: Lower because of incremental approach. Several opportunities for success. Management: Higher because of requirements uncertainty and dynamic nature of project. Cost: Higher because of uncertainty and high cost of cutting edge technology.

Table 2.1. Comparisons of the Traditional and EA Approaches.
Sources: USAF EA Guide, Henderson and Gabb, JLCG (1998) and DoDR 5000.2-R 4, 6, 14, and 20

I. MISCONCEPTIONS

The purpose of this section is to elaborate on the many misconceptions about EA in respect to terminology and methods. Much of this background is not captured or quoted

from a specific author or instruction. Its verification is backed by conversations with instructors, contracting officers, program managers and reading on the subject of EA.

1. EA is Simply an Incremental Acquisition

"EA's main difference from incremental acquisitions is that the requirements are intended to evolve during development, by comparison, incremental acquisition is much more rigid in its approach." (Henderson and Gabb, 1997, 10) An incremental acquisition is similar to the traditional acquisition, except that system design, development and production may occur in a series of increments. Incremental acquisition is often managed under a single contract. It differs from EA because the requirements and often the design are stable before system development begins.

2. EA is Simply a Phased Acquisition

This type of acquisition is typically used where there are serious risks, uncertainties or difficulties when planning a program. It provides decision points (and often delays) between the phases, when the direction of a project may be significantly changed. There is generally more certainty in an EA program, even though EA can be viewed as a phased approach. An EA program does not have delays between the phases. There is always continuous planning for both current and future phases/increments. All breaks or delays between phases are eliminated.

3. EA is Simply a Strategy to Avoid Formal Funding Procedures

EA is seen by some to be inherently flexible because it presents the opportunity to gain approval of a program before the program objectives and risks are defined. This,

however, is far from the truth. EA must have a well-defined core capability and associated risks must be identified. Under the DOD 5000 Model, a user need or idea is not a program until it successfully enters Milestone B. One of the many requirements for Milestone B is to have a defined acquisition strategy of which risk reduction is a key component. Additionally, the ORD identifies the initial core capability that will be achieved by the acquisition strategy. Milestone B does not require all risk to be removed, but it does require risk to be acceptable and controllable based on a defined core capability. Therefore, the time-phased approach of EA does not provide the basis to circumvent the requirements and secure funding.

4. EA is Simply a Prototyping Approach

EA does not result in the delivery of prototypes. Systems fielded using EA are subject to the appropriate development standards and quality controls of the DOD-5000 model. Prototypes are not always subject to these rigorous measures and are not suitable for operational use. An example of this is the X-31 program. Many of the advanced combat aerodynamic characteristics can be used to improve future DoD aircraft. “Experience gained from the use of a the prototype may determine that a traditional acquisition model can be used from that point forward.” (Von, 1990, 6)

5. EA is Simply a Remedy for Poor Requirements

It is a common fallacy that EA is an ideal strategy for use when the basic user needs are difficult to identify. Although EA can accommodate changes in requirements and provides early incremental additions for users to use, inadequate requirements will increase cost and schedule. This will often prevent the fine-tuning of

the incremental additions, which is the strength of EA. “Attempting to compromise sound development practices with the intent of satisfying requirements through evolvability will only aggravate the very problem we are trying to solve.” (Thayer and Merlin, 1990, 3)

J. CHAPTER SUMMARY

The foregoing information provides a historical perspective of the EA concept and how it has evolved to its current status. The chapter then focuses on the traditional acquisition approach. The traditional acquisition process is described and is followed by several shortcomings of this process. The chapter focus then changes to address the EA concept. The EA concept is explained and is followed by a justification for using EA and characteristics distinctive to the concept. A comparison of the two approaches is then presented to further identify the issues within each approach. The chapter concludes by providing several misconceptions of the EA concept.

The next chapter outlines the methodology and presentation of data. Data presented are based on survey results from contracting and program management personnel. The survey data will be presented in a format that supports answering the primary and secondary research questions.

III. METHODOLOGY AND DATA PRESENTATION

A. INTRODUCTION

In this chapter, the researcher presents results from two surveys, the baseline data for this research. The objective of the surveys is to collect data from experienced contracting and program management personnel (respondents) who work currently or previously on a MDAP. The questions from both surveys concern the EA approach and how this concept affects the core competencies of contracting and program management. The survey also addresses EA as a business function and questions respondents to determine if they believe EA is a process improvement. The survey concludes by questioning respondents concerning the issues, barriers and concerns that must be addressed to successfully implement the EA approach. Survey data are presented in section C of this chapter.

B. SURVEY METHODOLOGY

The two surveys, provided in their entirety in Appendices A and B, were distributed to contracting and program management personnel from Navy, Air Force and Army activities that contract for or support MDAPs. Survey respondents' experience levels ranged from teaching in an academic environment through managing an Acquisition Categories (ACAT) I through IV MDAPs. The surveys were conducted online, requiring respondents to simply access a link to the survey, complete the survey and forward the results to a central collection database at Naval Postgraduate School. The researcher received 42 responses total, 26 responses on contracting and 16 responses on the

program management surveys. With the exception of five questions, the surveys requested essentially identical information. Two of these questions dealt with core competencies of contracting personnel, and three dealt with core competencies of program management personnel.

Of the 26 respondents from the contracting survey, 18 were from the Navy, 3 were from the Army, 3 from the Air Force and 2 from the Defense Contract Management Agency (DCMA). A breakdown by service and contracting activity is outlined below.

Navy:	
Naval Air Systems Command	11 Respondents
Naval Sea Systems Command	5 Respondents
Space and Warfare Command	1 Respondent
Office of Naval Research	1 Respondent
Army:	
Communications and Electronics Command	2 Respondents
Aviation and Missile Command	1 Respondent
Air Force:	
Aeronautical Systems Center	2 Respondents
Aeronautical Aviation Center	1 Respondent
Defense Contract Management Agency	2 Respondents

Of the 16 respondents from the program management survey, 5 were from the Navy, 4 were from the Army and 7 from the Air Force. A breakdown by department and activity is outlined below.

Navy:	
Naval Sea Systems Command	5 Respondents
Army:	
Aviation and Missile Command	3 Respondents
Army Material Command	1 Respondent

Air Force:

Air Force Material Command	4 Respondents
Air Force Institute of Technology	3 Respondents

The contracting and program management surveys were developed to collect information in nine main areas:

- Demographics: Name and contact information of respondent (optional)
- The effect of EA on competition requirements in DOD.
- The advantages and disadvantages of EA in respect to the defense industrial base.
- The effect EA has on risk management.
- The effect EA will have on the contracting and program management workforce.
- The effect EA will have on Multi-Year Procurement funding.
- The role of market research under an EA approach.
- Whether EA is a functional improvement over the traditional approach.
- The issues, barriers or concerns that must be addressed before the EA concept can be successful implemented in DOD.

These nine areas were selected based on preliminary literature research and conversations with contracting officers and program managers. The objective was to identify core competencies that are critical to effectively use the EA concept for MDAPs.

C. SURVEY RESPONSES

Survey responses are presented in the following paragraphs. Follow-up interviews were conducted with several respondents and other DOD acquisition managers to clarify responses and address concerns. Where appropriate this follow-up information is presented. First, the

researcher will discuss the *purpose* of the information requested under that question's area of focus. Second, the researcher will *paraphrase* the responses. Finally, the researcher will present a *summary* of the responses.

1. Competition

a. Purpose

The first area of focus was on competition and how it relates to major weapon system acquisition. FAR Parts 6 and 34 govern these requirements for competition and state that:

> …the program manager shall promote full and open competition, sustain effective competition throughout the acquisition, and shall sustain competition as long as it is economically beneficial and practicable to do so. The contracting officer is responsible for timing the solicitation issuance and contract award to maintain the integrity of the acquisition process. (FAR, 2001, 780)

The responses to the question, do you think EA will have a negative effect on competition are paraphrased below.

- Competition after the core capability is developed and fielded could be negatively affected if the government does not own program data rights.
- Accelerated delivery or shorted life cycles could hinder some contractors from presenting proposals. This all depends on the infrastructure of each potential contractor.
- If the requirements are inadequately identified some contractor may lean to the side of caution and not submit proposals.
- When a contractor is chosen as prime for the initial phase or core capability, he has an inherent advantage of receiving all follow-on phases or increments of the acquisition program.

- Even though long-term partnering creates program stability it could negatively affect competition. We must be able to weight program stability and reduced life-cycle costs against possibly diminishing potential contractors from follow-on contract awards and the defense industrial base.

Responses	Yes	No	Don't Know
Contracting Personnel	6	11	9
Program Managers	3	10	3

Table 4.1. Will EA Have a Negative Affect on Competition.
Source: Developed by Researcher

b. Summary

There appears to be a spectrum of answers in response to this question. The majority of respondents (21) did not believe EA would have a negative affect on competition. A significant portion, (12), of respondents "did not know" what effect EA will have on competition. Several follow-up calls were to these respondents and the overwhelming response was that they were leaning toward an answer of "yes". This was especially prevalent with contracting personnel. The result is a 60/40 split for contracting personnel who believe competition will be negatively effected. The preponderance of the responses from the program management side stated competition would not be negatively affected.

The theme of the respondents who believe competition will be negatively affected is focused in three major areas: data rights ownership, requirement identification and long-term relationships. First, there

is concern that if the government does not own program data rights, follow-on competition could be hindered. Second, there appears to be confusion that requirements are not stable during the core capability. Third, there seems to be some apprehension about the government entering into long-term relationships.

2. The Industrial Base

a. Purpose

There is a continuing trend toward corporate "mergers and acquisitions, which reduces the number of potential suppliers available" in the Defense Industry (PRT, 1999, 4). The researcher contends that U.S. Defense industry remains the world leader even though "defense dollars are dwindling and the industrial base is shrinking" (Cahlink, 2001, 31). DODR 5000.2-R requires that PMs address the industrial base capabilities within the acquisition strategy and advise the DOD Component Acquisition Executive when capabilities are in danger of being lost (DoDR 5000.2-R, 2001, 47). The financial health of the industrial base is questionable due to decreasing budgets throughout the 1990's coupled with significant reductions in research and development spending. The responses in respect to how EA will affect the industrial base are as follows:

Advantages:

- When conducted properly, EA will permit early development and production of weapon systems that should help maintain a viable industrial base. This should allow for more efficient implementation of programs within budget constraints.
- Flexibility will be instilled in the acquisition strategy. If the prime contractor for the initial capability is a "dead horse" (non-

performer), the flexibility of the EA approach will allow other, possibly new, contractors to compete in follow-on phases or increments.

- EA will support and help maintain a viable industrial base because only the best contractors will remain. The advantage of EA is that long-term relationships will be formed providing positive affects on life cycle planning and support. Additionally, a consistent vendor base will diminish the level of parts obsolescence.

Disadvantages:

- Long-term commitment to a single contractor will increase the viability of that specific contractor but will harm the health of others remaining in the industry.
- The industry will suffer because long-term relationships will drive potential competitors from the market, limiting the amount of new or "refreshed" technology.
- With the emphasis on open architectures, commercial and dual use technology will become commonplace. The government is now forced to compete with the commercial industry for breaking technology.

b. Summary

The responses of those who perceive EA as being advantageous to the industry are focused in two areas: obtaining the most capable contractors and forcing out contractors that don't perform. First, contractor performance must meet or exceed the contract requirements. Contractors must perform or be replaced by other traditional and non-traditional contractors. Second, "rightsizing" is transpiring in the industrial base. Those contractors who don't perform will be forced out, opening the door for expansion in the industry.

The responses of those who perceive EA as being disadvantageous to the industry are focused in two areas:

concern about long-term relationships and increased reliance on commercial and dual-use technologies. First, the belief is that long-term relationships will impede other contractors' opportunity to compete while simultaneously driving them out of the industry. Second, weapon systems are more software and technology driven, providing numerous opportunities for use of commercial and dual-use technologies. This trend will force DOD to compete against the rest of the world for the best technology.

3. Risk Management

a. Purpose

Risk can be thought of or described in terms of its dimensions and its relationship to uncertainty. Outcomes, both positive and negative, are considered. "Parameters are established to consider how much risk is used and whether combinations of risk will be regarded as descriptive of the whole." (Shapira, 1995, 2-24) The acquisition strategy shall address risk. "The PM shall identify the risk areas of the program and integrate risk management within overall program management." (DoDR 5000.2-R. 2001, 29) The responses to how EA will affect risk are as follows:

Contracting Personnel:

- The majority of contracting personnel believed that, overall, risk would be reduced under an EA approach. With respect to the three major areas of risk (performance, schedule and cost), almost 50% of contracting respondents believed performance risk was the most important measure of risk. Schedule and cost risk received 5 and 4 votes, respectively. There were 5 respondents who "did not know" how EA affects risk.

- Likewise, the majority of program management personnel believed risk would be reduced under an EA approach. Unlike contracting personnel, 8 of 16 PM respondents believed cost risk was the most important measure of risk. Performance and Schedule risk received 4 and 3 votes, respectively. There was 1 respondent with no opinion.

Responses	Increase	Decrease	Don't Know
Contracting Personnel	8	16	2
Program Management Personnel	2	13	1

Table 4.2. Effect EA Will Have on Risk.
Source: Developed by Researcher

Responses	Performance	Schedule	Cost	Don't Know
Contracting Personnel	12	5	4	5
Program Management Personnel	4	3	8	1

Table 4.3. Most Important Areas of Risk.
Source: Developed by Researcher

b. Summary

There seems to be a consensus from both contracting and program management personnel; that an EA approach will reduce overall risk. However, there is no consistency between the beliefs of contracting and program management personnel on the type of risk that is most significant. Contracting personnel believe performance

risk is most significant while program management personnel favor cost risk.

4. Acquisition Workforce

a. Purpose

"The workforce will need new skills and perhaps adopt a new mindset to enable it to contribute effectively in the changing environment of the 21st century." (PRT, 1999, 5) The readiness of the total acquisition workforce is paramount if acquisition reform objectives are to be met. The responses to how will EA affect the workload on contracting and program personnel are highlighted in Table 4.4 below:

	No Increase	**20% Increase**	**35% Increase**	**Greater than 50%**	**Don't Know**
Contracting Personnel	16	2	3	2	3
Program Management Personnel	4	3	3	6	0

Table 4.4. Effects of EA on Workforce Workload. [Source: Developed by Researcher]

Contracting Personnel:

The majority of respondents believe there will be no increase in the workload of contracting personnel. The rationale for those respondents who believe workload will be increased is outlined below:

- Multiple award contracts for follow-on increments will increase both planning time and integration efforts.

- Re-competition at the end of core capability and each increment will increase the burden on acquisition planning.
- The EA approach will increase the number of Engineering Change Proposals, and Justifications and Approvals resulting from competitive source selections.

Program Management Personnel:

The majority of respondents believe there will be a marginal to significant increase in workload for program management personnel. The rationale for respondents who believe workload will be increased is outlined below:

- System engineering requirements with respect to integrated logistics support reviews, configuration development, testing and evaluation and interoperability will provide additional challenges in an already active environment.
- Longer schedules results in longer periods for the PM to defend the budget. The result is programs that are continually restructured to support a dynamic budget.
- Training personnel to conduct business under this fundamentally new approach. This approach forces PMs to stay abreast or ahead of technology as it matures.

b. Summary

Contracting and Program Management personnel have conflicting views regarding how EA will affect personnel workload. Overall, the preponderance of contracting personnel support the position that there will be no increase in workload on DOD personnel. Conversely, program management personnel believe there will be at least some increase in workload.

5. Multi-Year Procurement Funding

a. Purpose

United States Code (USC) Title 10, Section 2306b requires certain criteria to be met before MYP funding can be used. Three of these requirements are of specific concern if an EA concept is to be used. These requirements are: substantial savings, stable requirements, and stable design.

Additionally, the Fiscal Year 1998 DOD Authorization Act made the following changes to United States Code (USC) Title 10, Section 2306b. MYPs cannot be awarded for greater than $500 million without written act of law in the form of an appropriation act and an "other than appropriation act". (NDA, 1998, sec 806) The EA concept may have difficulty meeting the Title 10 criteria and the DoD Authorization Act financial threshold. Based on the above issues, Table 4.5 outlines responses to the question, will EA reduce the number of MYPs.

	Yes	**No**	**No Reply**
Contracting Personnel	5	18	3
Program Management Personnel	2	13	1

Table 4.5. Will EA Reduce the Number of MYPs.
Source: Developed by Researcher

The majority of both contracting and program management personnel believe the EA will not affect the

number of MYP contracts within DOD. However, there were concerns on both sides regarding fiscal policy and design stability. The responses are paraphrased below:

- Unless there is significant change in fiscal policy and laws, an EA approach will be challenged on Capitol Hill. Historically, it is difficult to get Congress on the side of DOD when MYP is the subject.
- MYPs can be increased under an EA approach if senior acquisition managers can illustrate to Congress that the DOD is fully devoted to an acquisition and will continually fund it over time.
- EA by definition has an unstable design for longer periods as compared to a traditional procurement. It will be difficult to win a political battle when DOD cannot adhere to the basic guidelines for MYPs. A requirement of MYP is stable designs and mature technology.
- Potentially, MYPs can be increased if programs can take advantage of an open architecture for its basic hardware and this hardware remains basically intact throughout fielding. Changes can only occur in software related technologies.

b. Summary

The consensus is that EA and MYP are a prudent combination when the criteria for both approaches are met. There are two points that must be accepted and supported, fiscal policy and strong backing by DOD. Within USC Title 10, Congress has provided specific criteria for MYPs, and they are unyielding when it comes to waivers. Additionally, DOD must fully support programs selected for MYP throughout the life of the program. For a EA program to be a strong MYP candidate, it must be backed with steadfast support throughout DoD.

6. Market Research

a. Purpose

The FAR states that market research is “the most suitable approach to acquiring, distributing, and support supply services” to satisfy agency needs. (FAR, 2001, 191) For MDAPs

> the PM shall use market research as a primary means to determine the availability and suitability of commercial and non-developmental items, and the extent to which the interfaces for these items have broad market acceptance, standards-organization support, and stability. Market research shall support the acquisition planning and decision process, supplying technical and business information about commercial technology and industrial capabilities. (DoDR 5000.2-R, 2001, 45-46)

For an EA approach, the key to market research is understanding how requirements evolve and developing a strategy to satisfy those requirements. To support the strategy the two phases of market research, market surveillance and market investigation (www.acq-ref.navy.mil, 2001), must be ongoing and continuous throughout any program that uses the EA approach.

The results from survey respondents concerning the role of market research in an EA approach are outlined in Table 4.6. Only contracting personnel were asked this survey question. During preliminary study on the EA concept, the researcher concluded that market research was a core competency of contracting personnel. Program management personnel are involved as required.

	Increased Role	Remain the Same	Don't Know
Contracting Personnel	17	3	6

Table 4.6. Role of Market Research under an EA Approach.
Source: Developed by Researcher

Over 65% of respondents believe market research will play an increased role under an EA strategy. Almost 25% of respondents "did not know" how the role of market research would be affected. Specific areas of interest are outlined in Table 4.7. The survey requested respondents provide three areas of market research requiring additional emphasis for an EA approach. The responses highlighted 7 areas of interest: competition, technology, integration, COTS, cycle time, supportability and acquisition cost. The most prevalent area was technology, which was followed closely by competition, integration and cycle time.

Area of Focus	Number of Responses
Competition	5
Technology	7
Integration	4
COTS	1
Cycle Time	4
Supportability	2
Acquisition Cost	4

Table 4.7. Areas Market Research Will Emphasize.
Source: Developed by Researcher

b. Summary

The survey respondents believe market research is a key component of the overall strategy of acquiring weapon systems. The survey responses encompass the entire realm of market research and show that emphasis is required during all increments for a program using the EA approach. Although only 65% believed the role market research would increase, all concurred market research continues to be an important measure of success for all acquisitions.

7. EA as a Process Improvement

a. Purpose

In the analysis chapter, this question will be analyzed from a business perspective using the BPI methodology. Data from respondents concerning EA being an improvement is outlined in Table 4.8.

	Yes	**No**	**Don't Know**
Contracting Personnel	10	4	12
Program Management Personnel	7	6	3

Table 4.8. Is EA an Improvement of the Acquisition Process.
Source: Developed by Researcher

There is not a consensus by either the contracting or program management personnel with respect to EA being a improvement over the traditional approach. A concern is the number of respondents who "did not know".

Over 45% of contracting personnel “did not know” while about 20% of program management personnel followed suit.

Of the contracting personnel who determined EA is an improvement, 9 of 10 have worked on programs that use EA concepts. A similar trend is prevalent with program management personnel; 7 of 7 respondents who believe EA is an improvement have EA experience. There are 2 program management respondents with EA program experience who do not believe EA is an improvement.

b. Summary

The lack of practical (programs using EA concepts) experience by the majority of respondents created difficulty in effectively answering this question. Of those respondents who have experience using the EA concept, the overwhelming majority felt that EA is an improvement over the traditional approach. These differences of opinions will be analyzed in chapter V.

8. Issues, Barriers and Concerns

a. Purpose

The primary question for this research asks what issues, barriers, and concerns must be addressed before DoD can successfully transition to an EA approach. The previous seven sections attempted to identify many of the issues, barriers, and concerns. In this final section, the survey respondents were asked this question, and their responses are presented below.

Multiple Configurations

- As multiple configurations of a weapon programs are presented to the user, life cycle costs are expected to increase significantly.

- Operations and Maintenance funding must be sufficient to support fielding of multiple increments.
- Parts support must be sufficient for each increment fielded.
- Configuration changes and modifications must be carefully monitored to ensure traceability.

Open Systems Architecture

- Open systems architecture must be truly open. With declining defense budgets DOD cannot afford to spend “good money” after “bad money”.
- If core capabilities are not workable, don’t tie up additional funding correcting the original problem. Acquisition managers must track the intent of the original procurement and if it this goes awry change direction.

Total Cost Perspective

- When we use EA, the total cost of the program must be addressed in the original acquisition strategy.
- For an EA program to be successful it must receive full support, both politically and financially. DOD has to fully support the program during the budget process.

Sole Source Procurement

- Widespread use of EA across DOD could develop concerns about sole source contracting for follow-on increments. Even when it is in the best interest of the government, sole source contracting could limit capabilities of future increments and initiate numerous legal concerns

User Understanding

- The user must fully understand evolutionary development and what the contract will deliver.

- The acquisition managers can control the independent variables, like schedule and CAIV, where appropriate. Acquisition managers cannot control performance, which is the customer's expectation.

PPBS Cycle

- EA fails to address a real problem, the Planning Programming and Budgeting System (PPBS).
- Upfront stable funding is critical for the process to be successful. This fortifies the need for teamwork from top to bottom and throughout the acquisition process.

Inflated Requirements

- The ORD and Joint Requirements Oversight Council (JROC) must be in agreement.
- Key Performance Parameters (KPP) must be well defined and suitable for user needs.
- We cannot succeed by inflating KPPs just because they are nice to have. This will ultimately slow fielding of the core or incremental capabilities.

b. Summary

The respondents outlined 8 broad areas of issues, barriers and concerns that must be addressed before the successful implementation of EA. These areas require involvement from the user, contracting and program management personnel, senior DOD executives and Congress. To address these areas, DOD must look at the total process and base decisions on meeting the user objectives. Understanding requirements, program support, collaboration and teaming are keys in addressing these areas of concern.

D. CHAPTER SUMMARY

In this chapter, the researcher presented survey responses from knowledgeable DOD contracting and program

management personnel who have major weapon system acquisition experience. The responses provided insight on the core competencies of contracting and program management personnel and how they correlate to an EA approach. Furthermore, the responses looked at the EA concept and provided insight on evaluating it as an improvement compared to the traditional acquisition approach. Finally, the survey provided potential issues, barriers and concerns that could hinder the successful implementation of an EA approach.

The next chapter analyzes these areas of focus and potential issues, barriers and concerns with respect to implementing the EA concept. The analysis is aligned around the research questions in Chapter I and based on respondents' answers presented in Chapter III.

IV. ANALYSIS OF SURVEY RESULTS

A. INTRODUCTION

Given the uncertainty of defense budgets and future needs, acquisition managers must utilize every tool available to effectively streamline business practices while simultaneously maximizing efficiency. The analysis in this chapter is aligned around the research questions from Chapter I. Survey data from Chapter III outlined six "areas of focus". The areas of focus from Chapter III are: Competition, Defense Industrial Base, Risk Management, Acquisition Workforce, Multi-Year Procurement, Market Research, Functional Improvement, and Issues, Barriers and Concerns.

In addition to the areas of focus, the data for two other questions are presented. These questions are: Is EA a functional improvement of the acquisition process, and what are the issues, barriers and concerns associated with using an EA approach.

B. WHAT ARE THE NEW REQUIREMENTS

This section analyzes the survey respondents' concerns about new requirements in the above areas of focus and their responses to two additional questions. This research has determined that not all survey respondents' concerns reflect new requirements. Specifically why they are not new requirements will be addressed in the sections below.

1. Competition

In Table 4.1, the respondents' results were inconclusive. The slight majority of contracting personnel believe that competition will have a negative effect on programs using an EA approach. Respondents outline several

new issues or concerns regarding competition. They are data rights, requirements identification, and long-term relationships. Some of these issues or concerns are identified as new requirements later in this section. Others are presented for what their actual role will be under an EA approach. Reasoning for each is addressed in the following paragraphs.

Respondents state that contractors will be reluctant to lose data rights because they may lose their competitive edge. They also believe the incremental nature of EA will either force the government to purchase data rights or establish sole source procurements for programs using EA more often. Of course, the concern about data rights is not new; data rights have long been a concern under the traditional approach. DoD has purchased data rights in the past when it was necessary to enhance competition in the industry. Additionally, if a sole source procurement is required, FAR Part 6 outlines criteria for other than full and open competition. The issue of data rights may become an issue more often but it is not a new requirement.

According to contracting survey respondents, the requirements identification process must be clear and adequately identified. With a limited number of new weapon systems being developed and the significant cost associated with developing proposals, contractors may be reluctant to submit proposals if there is any concern about hard requirements. Again, under the traditional and other acquisition approaches, the need for clear and adequately defined requirements has always been an issue or concern. In every system acquisition, the DoD 5000 model incorporates milestone decision reviews that validate

requirements. Specifically, for a program to enter Milestone C it must have an approved ORD and an approved acquisition strategy. These documents cannot be developed properly if the requirements are not clear and defined. Finally, these documents provide detailed information that is later outlined in a proposal. When an EA approach is used, each incremental ORD must meet the same criteria for clear and defined requirements. Therefore, the researcher believes the respondents' issues concerning clearly defined requirements are not new requirements. In this situation, it appears that respondents confused the characteristic of evolving requirements to mean unclear and undefined. This is far from the truth when an EA approach is used.

Respondents believe there is a significant tradeoff between long-term partnering and competition. The researcher agrees that there should be concern about long-term partnering and the effect on competition. However, the issue itself is not new. Throughout the acquisition community long-term partnering and competition are buzzwords one hears almost routinely. Franck addresses the concern with long-term partners in the following passage. "Dealing with only one supplier is considered unacceptable, because of the obvious loss of bargaining advantage and lack of incentive of innovation." (Franck, 2001, 4) However, Roberson (1998) argues that long-term partnering and competition is not a new requirement. He states, "The minimum acceptable market size for any major defense product is three firms." (Roberson, 1998, 91) These statements indicate that we should be continually concerned about long-term partnering and its effect on competition; however, the researcher believes there is no justification

for this to be a new requirement under the EA approach. It is believed that respondents expressed concern in this area because of an assumption that the EA approach will provide an inherent advantage to the initial contractor. Because of this, they would expect the majority of follow-on contracts to be awarded to the original partner and create unintentional long-term relationships. DoDR 5000.2-R supports competition under an EA approach and specifically addresses full competition between each incremental release.

2. Industrial Base

The respondents believe only the best contractors will survive because market conditions will control the industry. Over the last two decades many defense contractors have consolidated to make themselves more efficient and attempt to maintain their competitive edge over other traditional players in the industry. For example, since 1985 Boeing Aircraft has acquired McDonnell Douglas, ARCO Systems, UTL Corporation and Rockwell (JLCG, 1998, Fig. I.1). Conversely, of the 100 or so contractors the Navy made procurements with in FY2000, there are a significant number of non-traditional names. Companies and organizations like Motorola, MIT, John Hopkins University, AT&T, B.F. Goodrich, Proctor and Gamble, Dell, Pacific Gas & Electric and Philip Morris (www.govexec.com, 2001) are gaining increasing percentages of defense dollars. The evolution of defense procurement is allowing previously non-traditional players to gain increasing market share within the defense industry. This is advantageous to DoD and an issue for concern, however, it is obviously not a new requirement.

Respondents also believe the marketplace for technology is expanding and DoD must take full advantage of commercial and dual-use technologies that are available in the commercial industry. The EA concept requires DoD to compete for the best technology from a "world" of competitors. New technology and breakthroughs surface almost on daily basis. DoD has made provisions in the past to ensure DoD harbors new technology and breakthroughs when they are appropriate and meet the needs of our users. Both the FAR and DoDR 5000.2-R addressed commercial and dual-use technology before the EA concept was officially approved in October 2000. This issue is and will continue to a major concern for a long time, but again, it is not a new requirement that must be addressed under an EA approach.

3. Risk Management

In Table 4.3, there is lack of consensus between contracting and program management personnel on the most prevalent type of risk. This indicates that these managers view program execution from two distinct perspectives. Simply put, contracting personnel are more concerned with administration and contract performance and thus lean toward performance risk. In contrast, program management personnel are accountable to the users, senior DOD acquisition executives and Congress for overall management of a program. Cost is the most visible aspect of management and thus the most important risk factor to PMs. The FAR and DoDR 5000.2-R are in agreement that risk must be addressed in every acquisition, but risk has been addressed in this manner for many years and long before the EA concept began.

Like the traditional approach, the relationship between contracting and program management personnel on a program using the EA concept should be a critical component for success. Indeed it may alleviate problems if these managers establish stronger relationships and become more appreciative of the others' view on risk. Any type of risk reduction or avoidance in extremely important, but the issue of risk in programs using an EA approach is not a new requirement.

4. Acquisition Workforce

The majority of contracting personnel view contract execution as a single separate event. They believe the same is true when it applies to an EA approach even when it necessitates two or more follow-on contracts. Thus, from the contracting perspective, there is no obvious change in workload or issues to be addressed when the EA approach is used. From the PM perspective, EA creates a multitude of incremental cycles or phases. All core competencies of program management are challenged because as programs evolve from one increment to the next each competency is revisited. Thus, program management personnel believe their workload will increase under an EA approach.

The researcher believes there is a new requirement concerning the acquisition workforce. The new requirement is training for the acquisition workforce on the EA concept. Looking at the statistical data from Table 4.4, there seems to be confusion concerning how this approach will affect program workload for contract and program management issues. For example, there were 7 of 26 contracting respondents who thought EA would increase workload by 20-50% or more, and an additional 3 respondents

"did not know". Although the majority of contracting personnel thought EA would not affect the workload, there is a wide variance between those who thought the workload would change. For program management personnel, 12 of 16 respondents thought workload would increase. Statistically, 50% of these personnel thought the workload increase would be greater than 50%. From these statistics it is clear there are many unknowns within the acquisition workforce concerning the EA approach. Obviously, training on the EA approach is warranted in order to clarify their differences and help determine the true effect on the acquisition workforce.

5. Multi-Year Procurement

U.S.C. Title 10 and the 1998 DoD Authorization Act outline specific criteria for MYP approval. These regulatory requirements already present stringent criteria for MYP approval under the traditional approach; adding EA only increases the difficulty of the process because of the need for additional collaboration and support from DoD acquisition managers. Survey respondents believe EA will not reduce the number of MYP contracts when an EA approach is used; thus there is no issue to address.

In turn, the researcher believes that senior DoD staff and Congressional staff must collaborate and revise MYP criteria for the EA approach. The current criteria will stifle the majority of programs that use the EA approach. Specifically, two of the six criteria for MYP are stable design and substantial savings. The uniqueness of the EA approach emphasizes an incremental capability to the user. This contradicts the criteria for a stable design and essentially nullifies MYP as a possible funding strategy.

The EA approach cannot even be considered if it can't meet the basic MYP criteria.

When total program costs are compared to the series of annual contracts, MYP criteria requires there to be substantial savings. Because of incremental capabilities associated with the EA approach, it is difficult to forecast future system costs for one year, not to mention several. The same logic applies here; if it is not possible to meet the basic criteria, it is also not possible to be considered for MYP funds. If DoD is to make MYP a viable funding option under an EA approach, changes to the current MYP criteria must be made.

6. Market Research

The respondents believe the role of market research will be increased under an EA approach. This issue is outlined in Table 4.7 where respondents identified seven different areas of market research that require additional emphasis. The continually changing nature of EA approach requires managers to stay abreast of new and emerging technology as programs evolve from one increment to the next. To support the emphasis on market research effort, DoDR 5000.2-R "requires the acquisition strategy to include the results of completed market research and plans for future market research." (DoDR 5000.2-R, 2001, 46) The FAR also supports the role of market research. FAR Part 10 emphasizes the use of commercial and non-developmental items that may meet the needs of the user.

There are two components of market research: market surveillance and market investigation. Under EA, the role of market investigation will be emphasized more often.

Market investigation is normally for a specific requirement. EA's incremental nature creates two or more specific requirements causing the market investigation role to surface several times during an EA approach.

7. Issues, Barriers, and Concerns

a. Multiple Configurations

As part of any acquisition strategy, the PM is required to develop a "support strategy for life cycle sustainment and continuous improvement of product affordability, reliability, and supportability, while sustaining readiness." (DoDR 5000.2-R, 35) When compared to the traditional approach, issues associated with multiple configurations under an EA approach are amplified. This issue is a new requirement because the PMs must establish a new framework for developing and tracking multiple configurations that ensures adequate traceability. Specifically, the support strategy for multiple configurations may create challenges from a management and financial standpoint.

For management, each increment must have a detailed support strategy that allows for contractor logistics support (CLS), integration of manpower, safety, training and numerous other considerations. As the number of increments increase, maintaining a detailed but separate support strategy for each requires a massive effort. This management effort is compounded when increments are produced and fielded by different defense contractors.

From a financial standpoint, the PM is bound by the competitive process to select the support strategy that provides the best value to the DoD. Although multiple source competition is encouraged, it is more difficult to

find the most efficient and cost effective mix for the various management considerations (CLS, manpower, safety etc.). With sustained readiness being the objective, PMs will be challenged to maintain seamless but adequate controls over multiple configurations.

b. Open Systems Architecture

Open systems architecture may be an issue that must be addressed, but it is not a new requirement. Open system architecture has been used effectively under the traditional and other acquisition strategies. For example, the Army's THAAD system provided the user an initial missile defense capability and upgraded that capability in the next phase of development. This program used EA methods but was managed under a traditional approach.

c. Total Cost Perspective

Each EA program must be viewed from a total cost perspective that takes in account anticipated costs of all increments. PMs are required to look at all programs from a macro perspective. Specifically, the acquisition strategy requires the PM to "develop an acquisition strategy in preparation for program initiation, prior to a program initiation decision, and update it prior to all major program decisions points or whenever the approved acquisition strategy changes." (DoDR 5000.2-R, 2001, 27) As the overall responsible manager for a program, the PM has always been required to see the big picture, and this includes total cost.

d. User Understanding

Survey respondents believe the lack of interface between the user and program office creates dissension concerning the overall program management process. This issue indicates a new requirement because users do not

understand the true benefits of the EA approach. Program offices must communicate and train the user on the characteristics of EA. For example, a user requests a specific requirement (capability) by year 2010. The PM is tasked to meet the requirement and schedule. Under EA, the PM may be able to provide the user an incremental capability by 2004, and upgrade in 2007 and a final capability by 2010. The EA approach does not diminish the user's original requirement. What EA provides is capability earlier in the life cycle and upgrades along the way.

e. PPBS Cycle

If long-term stable funding is an issue for a traditional program, clearly it is an issue under an EA approach. Several respondents stated that the PPBS cycle is an issue but failed to provide specific concerns. Respondents claim upfront stable funding and a need for teamwork is the major concerns for this issue. Because respondents provided only minimal information on this issue, the researcher cannot determine the nature of this new requirement. What can be determined is that further investigation is required to see how EA programs are affected by the PPBS cycle.

f. Inflated Requirements

Respondents believe inflating requirements under an EA approach will extend the development period and delay fielding. This fact may be true, but the issue is not a requirement. This issue is a problem under the traditional approach and is a reason the traditional approach takes so long to field systems. For example, under the traditional approach if one of the KPPs is not attainable for many years, this is essentially an inflated requirement. The EA

approach minimizes the fielding time because of the incremental capabilities and limits KPPs and technology to something that attainable in a specified period of time. Thus, inflated requirements are an issue but not a new requirement.

C. EFFECTS ON THE DEFENSE INDUSTRY

The section analyzes the survey responses concerning the effect EA will have on the defense industry. Only the area of focus that is applicable to the defense industry perspective is analyzed. These areas of focus are: the industrial base and risk management. Additionally, the issues, barriers, and concerns that affect the defense industry are analyzed.

1. Industrial Base

A concern of respondents is that accelerated delivery and shorter life cycles could hinder contractors from bidding on proposals. The effect on the defense industry is that the industry must change their mindset away from that of the traditional perspective of slow system development and fielding. The traditional mindset is a slow fielding process that depends on technology availability and KPPs viability. Recent mergers and acquisitions in the defense industry have done much to change its mindset and provide contractors infrastructure to efficiently support a wider range DoD performance parameters. Now, the industry must implement these efficiencies under an EA approach. As a recent example of the change in mindset, the Marine Division of General Dynamics has put forth a proposal to purchase Newport News Shipbuilding. General Dynamics is currently working on the

new Virginia Class submarine and Arleigh Burke class destroyer. This proposed merger should provide General Dynamics more innovation and dual-use opportunities to meet DoD performance requirements in several of its defense programs.

2. Risk Management

In table 4.2, the respondents indicated overall risk management under an EA strategy is reduced. Risk may be lower on the defense industry because of the inherent flexibility in the EA approach. Under the traditional approach, the contractor has one opportunity to meet the requirements without flaw. When the EA approach is used, the contractor has two or more attempts to meet the final capability. Performance risk is reduced. This may result in programs that are progressing in attainable increments instead of revolutionary leaps.

3. Issues, Barriers and Concerns

Respondents believe the development of multiple configurations under an EA approach will intensify contractor involvement with respect to repair parts support and maintenance. The defense industry must accept the challenge of supporting several variations of current weapon system. This challenge is different from the support and maintenance required for block upgrades under the traditional approach. The EA approach requires the industry to think in terms of “months and increments” instead of “years and blocks”.

D. IS EA A FUNCTIONAL IMPROVEMENT OF THE ACQUISITION PROCESS

This section analyzes the final research question of whether EA is a functional improvement of the acquisition

process. Analysis in this section is based on respondents data presented in Chapter IV.

Survey Analysis

Survey results show that 17 of 42 respondents believe EA is a functional improvement over the traditional approach. Separated by profession, this equates to 40% of contracting and only 20% of program management personnel who contend EA is a functional improvement. There is no basis for proving EA is a functional improvement based on these statistics. There were two specific concerns about the data associated with this question: the number of respondents who stated they "did not know" and statistics associated with respondents who have used EA methods in practice.

There were 15 of 42 (over 33%) respondents who stated they "did not know" to this question. This means that these managers are aware of the EA approach and its methodologies, but without practical experience on a true EA program a determination could not be made. Additionally, 100% (9 of 9) contracting personnel and 78% (7 of 9) program management personnel who have used EA methods on programs believe the EA approach is an improvement over the traditional process. The researcher felt this was not a basis for stating that the EA approach is an improvement because these programs used EA methods only. They were not true EA programs. These responses do indicate, however, the potential that EA may indeed be an improved acquisition approach.

Since this research has found no programs that utilize EA, the researcher believes this question cannot be

answered using survey data alone. Data from true EA programs are necessary to reach a finding.

E. CHAPTER SUMMARY

EA appears to be a relevant and critical acquisition tool that will allow managers to make informed decisions about the management of MDAPs. This chapter provided an analysis of the research questions outlined in Chapter I. The analysis addressed three areas: the new requirements EA will place on DoD; the effects EA will have on the defense industry: and the validity that EA is a functional improvement over the traditional acquisition process.

The next chapter presents conclusions derived from this research as well as recommendations associated with the research questions. The chapter concludes by providing further areas of research on the topic of EA.

THIS PAGE INTENTIONALLY LEFT BLANK

V. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

This thesis evaluated the use of Evolutionary Acquisition (EA) using survey responses from experienced DoD acquisition managers. These responses were used to answer the primary and two of four secondary questions. The remaining secondary questions were answered using a literature review and a business methodology.

In this closing chapter, the researcher provides answers to the primary and secondary research questions outlined in Chapter I. Next, the chapter provides conclusions and recommendations derived from this research effort with respect to using EA in the DoD. Finally, this thesis concludes by providing recommended areas for further research.

B. REVIEW OF RESEARCH QUESTIONS

The primary research question asks what issues must DoD address before successfully using an EA procurement strategy. Because many of these issues are addressed in the secondary research questions they will be focused on first.

1. Secondary Research Questions

- What is the background and history of Evolutionary Acquisition?

It is determined that the EA concept has been in existence in commercial applications since the mid 1970's. In 1987 it was first introduced as a military concept as a future development for the Joint Logistics Commanders Guide (JLCG) as a means to reduce the time to efficiently upgrade command and control (C2) systems. The JLCG was revised in

1995 and 1998, respectively, to support the increased emphasis on technology and further support the EA concept as a viable acquisition process.

Lessons from several acquisition programs like the F-117 and Theater High Altitude Air Defense (THAAD) system have laid the groundwork and policy basis for creating EA. Several EA pilot programs like the Navy Tactical Command Support System (NTCSS) and Battle Force Electronic Warfare Trainer (BEWT) were introduced in the 1980's and 1990s and used EA methods to support follow-on upgrades and technology changes in weapon systems. Most recently, the former Deputy Secretary of Defense, the Honorable Rudy de Leon, approved EA as an alternate strategy in October 2000.

- What new requirements does this acquisition approach place on the Department of Defense?

The EA approach puts additional pressure on many core competencies of contracting and program management. The researcher identified three areas where new influence must be directed to allow an EA strategy to be effectively used in DoD.

Acquisition Workforce. Unlike contracting personnel, program management personnel believe EA will create additional challenges to the acquisition workforce. Having two different perspectives points out that there is no clear understanding of the EA concept with respect to workload. The acquisition workforce needs training on the EA concept to be able to take full advantage of the benefits.

Multi-Year Procurement. The responses indicate 31 of 42 respondents believe that EA will not reduce the number of MYPs. However, the characteristics of EA indicate new

requirements regarding MYP. Senior DoD staff and Congressional staff must collaborate and revise MYP criteria for the EA approach. The regulatory requirements for MYP are stringent and were developed based on the traditional approach. This is a new requirement because DoD must push to have these requirements revised.

Market Research. The continually changing nature of EA requires acquisition managers to stay abreast of new and emerging technology as an EA program progresses. According to respondents, EA will create a broader scope of market research to look at. They highlighted seven areas where market research requires additional emphasis. This is new because of the increased emphasis.

- What are the possible effects of the new acquisition approach on the defense industry?

EA creates challenges not only for DoD but the defense industry as well. This research identified one area where EA will affect the defense industry.

Industrial Base. The effect on the defense industry is that the industry must change their mindset away from that of the traditional perspective of slow system development and fielding. The traditional mindset is a slow fielding process that depends on technology availability and KPPs viability. The industry must take advantage of innovation and technology gains through mergers and acquisitions to allow it to succeed in the dynamic environment of EA.

Risk Management. Performance risk is positively affected because the contractor has several opportunities to meet the final capability. This may result in programs

that are more manageable because the program is progressing in attainable increments instead of revolutionary leaps

- Is Evolutionary Acquisition a functional improvement of the acquisition process?

Based on survey responses, it could not be determined if EA is an improvement of the acquisition process. Although some survey respondents had worked on MDAPs that incorporated EA methods, no respondent had worked on a program that fully utilized an EA approach for the life cycle of the program. It is not possible to fully answer this question until true EA programs can be analyzed.

2. Primary Research Question

The secondary research questions outlined six areas of focus that must be addressed under an EA approach. The researcher has determined that these four areas of focus are also issues that DoD must address to successfully use EA as a procurement strategy. The primary research question outlines additional issues realized from survey results and follow-up telephone interviews. These issues are provided below. Issues outlined in the secondary research questions are not included.

- What issues must be addressed to allow the Department of Defense to successfully utilize an Evolutionary Acquisition approach.

Multiple Configurations. The challenge of multiple configurations is intensified under an EA strategy. The PM is required to develop a support strategy that will provide logistical support for each increment of an EA program. The PMs must establish a new framework for developing and tracking multiple configurations that ensures adequate traceability.

Open Systems Architecture. Open systems architecture was first used under the traditional approach. It continues to be an issue under EA because of the emphasis on competition of new requirements between increments. DoDR 5000.2-R requires PMs to promote competition between increments. Open systems architecture has proven itself under the traditional approach as an economical means of upgrading or changing technology within weapon systems. For EA to meet the competitive objectives, systems must be truly open and allow competitors opportunity to meet the requirements of the next increment.

Sole-Source Procurement. All incremental contracts for an EA approach must be autonomous with respect to follow-on increments or contracts. If competition is not practical, proper documentation (Justification and Approvals at the CAE or DAE level) is required. Contracting and program management personnel must be proactive in following regulatory guidance for “full competition” and “other than full and open competition”.

User Understanding. PMs must keep users apprised of the benefits of an EA program. The EA approach is designed to accomplish this but will not achieve it unless the program office proactively promotes it. Because EA is in its infancy stages, few users truly understand its benefits. This is a training issue for the user. The PMs must remember that they are also working for the user and thus must keep them abreast of program status. This is a management issue for the PM.

PPBS Cycle. This is an issue because survey responses did not provide sufficient information to allow a position

to be developed. Further investigation is required concerning how the PPBS cycle will affect the EA approach.

Inflated Requirements. Like the traditional approach, inflated requirements will continue to be an issue under EA. The focus of requirements is on the ORD and specifically, KPPs. The advantage of an EA program is lost when KPPs outlined in each incremental ORD are inflated with "nice to haves" and not based on anticipated mature technology. KPPs must be meticulously managed for the full benefits of the EA approach to be achieved.

C. CONCLUSIONS

Analysis of survey results and follow-on interviews have led the researcher to the following conclusions concerning the use of EA in the DoD.

Conclusion 1: The acquisition workforce does not truly understand the issues and characteristics of an EA approach. Training is necessary for DoD to take full benefit of this acquisition approach.

Conclusion 2: The industrial base must change its mindset away from a traditional perspective. It must stop thinking in terms of years and block but instead months and increments.

Conclusion 3: It is very difficult to meet the MYP criteria if an EA approach is used. Stable funding and substantial savings are not characteristics of an EA approach.

Conclusion 4: Market research must be emphasized under an EA approach if the full benefits are to be received.

Conclusion 5: Contracting and program management personnel are not in agreement on the most important aspects of risk as it relates to EA programs. Contracting and program management personnel must work together to evaluate risk and keep programs moving forward.

Conclusion 6: The acquisition community must take greater steps to ensure traceability is maintained over multiple configurations. The defense industry must accept additional responsibility of supporting several increments by maintaining adequate internal capacity to support current readiness and future upgrades to full capability.

Conclusion 7: It is unclear how the PPBS cycle will affect an EA program. Further investigation is required when true EA programs are developed.

One important reason EA shows resilience as an acquisition strategy is that many of its individual characteristics are proven under different conditions. A well-planned architecture and capability achieved incrementally are just two of these characteristics. An example of a well-planned architecture is the NTCSS. Even with recent technology advances, the NCTSS base architecture has supported 15 years progress and upgrades. The Army's THAAD program hallmarks incremental development. It made upgrades in two incremental stages that provided users an initial and improved capability. If EA is looked by individual characteristic it is not a new approach at all. However, when all the characteristics are combined, the EA concept, although unproven, is a dynamic acquisition strategy that appears to be an effective alternative to the traditional approach.

D. RECOMMENDATIONS

Based on the conclusions of this research, the following recommendations are provided:

Recommendation 1: Conduct more training on how to effectively use market research so DoD can take advantage of new entrants, commercial and dual-use technologies in the market place.

Recommendation 2: Develop guidelines or modify current guidelines to ensure multiple configurations are effectively upgraded as an EA program progresses.

Recommendation 3: Develop separate criteria or modify current criteria so the EA concept can be used for MYP funding when DoD determines it is appropriate.

Recommendation 4: When an EA approach is selected as the acquisition strategy, have the program office train users on the benefits of the approach.

Recommendation 5: Develop a joint DoD and Congressional staff panel to investigate the role of EA and how the PPBS cycle will affect its usage.

E. AREAS FOR FURTHER RESEARCH

The researcher poses the following areas for further study:

- Conduct an in depth evaluation of the Multi-Year Procurement process with respect to Evolutionary Acquisition programs. Determine what actions will increase approvals for multi-year funding.
- Several respondents complained about the contracting officer and program manager relationship on a wide variety of issues. Recommend further study on the relationship of these managers and how it can improve the EA process.
- When an appropriate number of EA programs are initiated, further investigate the role of

competition and determine how this role can improve the process.

- Develop a market research manual or web-based tool that will help all acquisition managers using EA efficiently to seek out commercial and dual-use technologies.
- Conduct research on how multiple configurations will affect the PM support strategy for MDAPs under EA.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A. EVOLUTIONARY ACQUISITION SURVEY FOR CONTRACTING PERSONNEL

1. Please enter your organization (i.e. Navy, Naval Sea Systems Command)
2. Please enter your name, position, phone number and/or email. (All or part is optional).
3. List up to three programs in which your organization used Evolutionary Acquisition.
4. Do you think Evolutionary Acquisition has a negative affect on the Competition requirements?

   Yes

   No

   Don't Know
5. If yes, list 3 reasons why Evolutionary Acquisition will have a negative affect on Competition. Otherwise enter N/A.
6. What effect will Evolutionary Acquisition have on maintaining a viable defense industrial base? List 3 advantages or disadvantages.
7. Risk management must be addressed in every acquisition strategy. Do think Evolutionary Acquisition will:

   Increase Risk

   Decrease Risk

   Don't know
8. Rank the following areas of Risk as it apples to Evolutionary Acquisition. One (1) is the most important.

   Performance

   Schedule

   Cost
9. Evolutionary Acquisition emphasizes the use of open-systems architecture. Will this emphasis increase the role of Market Research?

   Yes

   No

   Don't Know

10. If yes, list 3 areas where Market Research will be increased (i.e. cost, cycle time, integration, supportability, competition, technology, etc).

11. By what percentage will Evolutionary Acquisition increase the workload on contracting personnel?

    No increase

    10%

    20%

    35%

    Greater than 50%

12. If you chose 10% or more, specify 3 areas where Evolutionary Acquisition will increase the workload on contracting personnel.

13. Do you think Evolutionary Acquisition will reduce the use of small businesses in executing contracts for Major Defense Acquisition Programs? If yes, up to 3 sentences why.

14. Do you think Evolutionary Acquisition will reduce the number of programs that use Multi-Year Procurement funding? If yes, up to three sentences why.

15. What new requirements, other than anything listed above, do your thing Evolutionary Acquisition will place on DoD? List up to 3 requirements.

16. Do you think Evolutionary Acquisition is a functional improvement over the traditional acquisition approach?

17. Other comments or issues you think are important. Thank you very much!

APPENDIX B. EVOLUTIONARY ACQUISITION SURVEYFOR PROGRAM MANAGERS

1. Please enter your organization (i.e. Navy, Naval Sea systems Command).
2. Please enter your name, position, phone number and/or email. (All or part is optional).
3. List up to 3 programs in which you or your organization used Evolutionary Acquisition as an acquisition strategy
4. Because Evolutionary Acquisition will produce several blocks/variants of core capabilities, do you believe DoD will have logistics/configuration management issues?

   Yes

   No

   Don’t Know
5. If yes, list your top 3 logistics/configuration management issues or concerns.
6. Risk management must be addressed in every acquisition strategy. Do think Evolutionary Acquisition will:

   Increase Risk

   Decrease Risk

   Don’t know if it will have a noticeable effect on Risk
7. Rank the following areas of Risk as it applies to Evolutionary Acquisition. One (1) is the most important.

   Performance

   Schedule

   Cost
8. By what percentage will Evolutionary Acquisition increase the workload on program management personnel?

   No increase

   10%

20%

35%

Greater than 50%

9. If you chose 10% or more, specify 3 areas where Evolutionary Acquisition will increase the workload on program management personnel.

10. Do you think the recent update of DoDR 5000.2-R fully supports Evolutionary Acquisition as an acquisition strategy for Major Defense Acquisition Programs? If yes, why? Up to 3 sentences.

11. Do you think Evolutionary Acquisition will reduce the number of program that use Multi-Year Procurement? If yes, why? Up to 3 sentences.

12. From the Program Manager perspective, is Evolutionary Acquisition a new approach or is it a "new name" to a current acquisition strategy. If no, explain? Up to 3 sentences.

13. List your top 3 program management issues, barriers, or concerns that must be addressed before Evolutionary Acquisition will work in DoD.

14. What new requirements, other than anything listed above, does this acquisition strategy place on DoD?

15. Do you think Evolutionary Acquisition is a functional improvement over the traditional acquisition approach?

16. Other comments, issues or barriers you think are important. Thank you very much!

APPENDIX C. LIST OF ACRONYMS

ACAT	Acquisition Category
ADM	Acquisition Decision Memorandum
APB	Acquisition Program Baseline
ASD(C3I)	Assistant Secretary of Defense (Command, Control, Communication and Intelligence)
CAE	Component Acquisition Executive
DAE	Defense Acquisition Executive
CINC	Commander in Chief
COTS	Commercial, Of-the-Shelf
DoD	Department of Defense
DOT&E	Director, Test and Evaluation
FAR	Federal Acquisition Regulation
IPT	Integrated Product Team
JROC	Joint Requirement Oversight Council
KPP	Key Performance Parameters
LRIP	Low-Rate Initial Production
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MNS	Mission Need Statement
NDI	Non-Developmental Item
NMS	National Military Strategy
NSS	National Security Strategy
OIPT	Overarching Integrated Product Team
ORD	Operational Requirement Document
OTE	Operational Testing and Evaluation
PEO	Program Executive Officer
PM	Program Manager
PPBS	Planning, Programming Budgeting System
SAE	Service Acquisition Executive
TEMP	Test and Evaluation Master Plan
U.S.C.	United States Code

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF REFERENCES

Axiotis, George, *Evolutionary Acquisition and Operational Testing, Time for a New Approach,* NAVSEA T&E Office, May 2000.

Cahlink, George, *Partners for Life*, pp. 31-36 Government Executive Magazine, October 2001.

Cohen, Scott A., *Using Evolutionary Acquisition Strategy to Improve the System Acquisition Process: A Case Study of the Remote Minehunting System*, Master's Thesis, Naval Postgraduate School, June 1997.

Cohen, W.S., *Report of Quadrennial Defense Review,* section VII, Office of Secretary of Defense, Washington D.C., May 1997

Defense Acquisition Deskbook (DAD) Joint Program Office, *Defense Acquisition Deskbook*, (CD-ROM) Version, 2000.

Federal Acquisition Regulation, CCH Incorporated, Chicago, IL. January 1, 2001.

Franck, Raymond E. Jr., *Recent Developments in the Global Defense Marketplace*, pp. 1-5, Naval Postgraduate School, August 2001.

Harrington, James H., *Business Process Improvement,* pp. 25-54, McGraw-Hill 1991.

Henderson Derek E., and Gabb, Andrew P, *Using Evolutionary Acquisition of the Procurement of Complex Systems*, Australian Department of Defense, 1997.

Hirsch, Edward, *Evolutionary Acquisition of Command and Control Systems, Signal*, 1985.

Johnson, Collie J., *Evolutionary Acquisition – We Need to Make It the Preferred Way*, pp. 8-11, Program Manager Magazine May-June 1999.

Keller, William C., *The Defense Resource Allocation Process*, Newport, RI, Naval War College, 1996.

National Center for Advanced Technology, *Proposed Acquisition Teamwork and Cycle Time Improvements: Evolutionary Defense Acquisition*, Washington, D.C. April 1996.

National Defense Authorization Act of 1982, Sec 909.

National Defense Authorization Act of 1998, Sec. 806.

Roberson, W., *The Future of the Defense Industrial Base,* p. 91-98, McGraw-Hill, New York, 1998.

Shapira, Zur, *Risk Taking: a Managerial Perspective*, Russell Sage Foundation, New York, 1995.

Thayer, Richard H. and Merlin Dorfman, *System and Software Requirements Engineering*, Tutorial, IEEE Computer Society Press, California 1990.

The Procurement Round Table, *The Federal Acquisition System; Transitioning into the 21st Century*, Washington D.C., December 1999.

U.S. Air Force, *Air Force Evolutionary Acquisition Guide*, November 2000.

U.S. Department of Defense Directive 5000.1, *The Defense Acquisition System*, Washington, DC, October 2000.

U.S. Department of Defense, Defense Systems Management College, *Acquisition Strategy Guide*, Second Edition, Fort Belvoir, VA, May 1999.

U.S. Department of Defense, Defense Systems Management College, *Joint Logistics Commanders Guide for the Use of an Evolutionary Acquisition Strategy in Acquiring Command and Control (C2) Systems*, Fort Belvoir, VA, March 1987.

U.S. Department of Defense, Defense Systems Management College, *Joint Logistics Commanders Guide for Use of Evolutionary Acquisition Strategy to Acquire Weapon Systems,* Fort Belvoir, VA May 1995.

U.S. Department of Defense, Defense Systems Management College, *Joint Logistics Commanders Guide for Use of*

Evolutionary Acquisition Strategy to Acquire Weapon Systems, Fort Belvoir, VA, June 1998.

U.S. Department of Defense, *DoDI 5000.2 Change 1 Operation of the Defense Acquisition System*, Under Secretary of Defense, January 2001.

U.S. Department of Defense, *Mandatory Procedures for Major Defense Acquisition Programs (MDAP) and Major Automated Information Systems (MAIS) Acquisition*, DODR 50002-R." June 2001.

United States Code, Office of Law Revision Counsel of the House of Representatives, 2001.

United States Government, Office of Management and Budget, *Major System Acquisitions: A Discussion of the Application of OMB Circular No. A-109),* Washington, DC, OFPP, 1996.

Von, Rolan, *Prototyping – the effective use of Case Technology*, Prentice Hall, Englewood Cliffs, NJ, 1990.

www.acq-ref.navy.mil/marketresearch/1module2.htm. Market research modules 1 and 2.

www.acq-ref.navy.mil/sstories/story_detail.cfm Acquisition reform website for *Department of the Navy Success Stories*.

www.govexec.com/news/index.cfm Government Executive Magazine excerpt (no author), *Top 100 Defense Contractors,* August 2001.

THIS PAGE INTENTIONALLY LEFT BLANK

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
   Fort Belvoir, Virginia

2. Dudley Knox Library
   Naval Postgraduate School
   Monterey, California 101

3. CDR Corey Yoder (Code GB/Lt) 2
   Naval Postgraduate School
   Monterey, California

4. Dr. Keith F. Snider (Code GB/Yc)
   Naval Postgraduate School
   Monterey, California

5. Dr. David Lamm (Code GB/Sk)
   Naval Postgraduate School
   Monterey, California

6. LCDR Marty Williams 1