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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

**DOD INFORMATION TECHNOLOGY ACQUISITION:
DELIVERING INFORMATION TECHNOLOGY
CAPABILITIES EXPEDITIOUSLY**

by

Melvin D. Burch-Bynum

September 2013

Thesis Advisor:
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Thomas Housel
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**DOD INFORMATION TECHNOLOGY ACQUISITION: DELIVERING
INFORMATION TECHNOLOGY CAPABILITIES EXPEDITIOUSLY**

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Submitted in partial fulfillment of the
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MASTER OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT

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ABSTRACT

Maintaining an information advantage for the Department of Defense (DoD) and its military departments is critical to national defense objectives and the acquisition of new information technology (IT) is key. The DoD seeks to quickly acquire IT systems that meet requirements and are within budget; however, this goal has been very difficult to achieve given the cumbersome and deliberate process through which IT systems have been acquired. Essentially, the DoD's acquisition process cannot keep pace with the rapid development of IT systems that occurs in the commercial sector. For years, the DoD has relied on a common approach in acquiring different systems and services. This approach has been laced with inefficiencies and inadequacies that have resulted in prolonged schedules as well as increased cost. Currently, the DoD is implementing a new IT acquisition process; however, this new process does not resolve all the issues that have plagued IT acquisition. This study will identify the causes or impeding factors that have prevented the DoD from acquiring new IT systems in a timely manner and will recommend alternative solutions to solving the problems. Ultimately, this thesis contributes to the DoD's efforts to resolve the issues that continue to undermine timely IT acquisition.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACAT	Acquisition Category
ADM	Acquisition Decision Memorandum
AIAS	Acquisition Information Assurance Strategy
AIS	Automated Information Systems
ANSI	American National Standards Institute
AoA	Analysis of Alternatives
APB	Acquisition Planning Baseline
ASD(NII)	Assistant Secretary of Defense for Networks & Information Integration
ASI	Acquisition Solutions Incorporated
BCD	Basic Capability Definition
BCL	Business Capability Lifecycle
BEA	Business Enterprise Architecture
BPM	Business Process Management
BPMN	Business Process Model and Notation
BPR	Business Process Re-engineering
CADA	Component Acquisition Decision Authority
CAE	Component Acquisition Executive
CAIV	Cost as independent variable
CCA	Clinger Cohen Act
CDD	Capabilities Development Document
CHSS	COTS Hardware, Software, and Services
CIO	Chief Information Officer
CMO	Chief Management Officer
CONOPS	Concept of Operations
COTS	Commercial off-the-shelf
C4I	Command, Control, Communications, Computers, and Intelligence
DAG	Defense Acquisition Guidebook
DAPA	Defense Acquisition Performance Assessment

DAU	Defense Acquisition University
DAWIA	Defense Acquisition Workforce Improvement Act DBS Defense Business System
DBSMC	Defense Business System Management Committee
DCMO	Deputy Chief Management Officer
DDR&E	Director of Defense Research and Engineering
DEAMS	Defense Enterprise Accounting and Management System
DEPSECDEF	Deputy Secretary of Defense
DISA	Defense Information Systems Agency
DITPR	DoD Information Technology Portfolio Repository
DMS	Data Management Strategy
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DOTMLPF	Doctrine, organization, training, materiel, leadership and education, personnel, and facilities
DRI	Defense Reform Initiative
DSB	Defense Science Board
DTM	Directive-Type Memorandum
EA	Economic Analysis
EIA	Electronic Industries Alliance
ERP	Enterprise Resource Planning
ESHO	Environment, Safety, and Occupational Health
EV	Earned Value
FD	Full Deployment
FDD	Full Deployment Decision
FIPT	Functional Integrated Process Team
FOC	Full Operational Capability
FYDP	Future Years Defense Program
GAO	Government Accountability Office
GIG	Global Information Grid
HASC	House Armed Services Committee

IID	Iterative Incremental development
IM	Investment Management
IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
IPPD	Integrated Product and Process Development
IPT	Integrated Product Teams
IRB	Investment Review Board
ISAF	International Security Assistance Force
ISP	Information Support Plan
IT	Information Technology
ITFL	IT Functional Leader
KPP	Key Performance Parameter
LCSP	Lifecycle Sustainment Plan
LRIP	Low-rate initial production
MAIS	Major Automated Information Systems
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MDD	Materiel Development Decision
MS	Milestone
NCW	Network Centric Warfare
NDAA	National Defense Authorization Act
NDS	National Defense Strategy
NEPA	National Environmental Policy Act
NRC	National Research Council
NSS	National Security Systems
ODCMO	Office of the Deputy Chief Management Officer
OFPP	Office of Federal Procurement Policy
OIPT	Overarching Integrated Product Teams
O&M	Operations and Maintenance
OMB	Office of Management and Budget
O&S	Operations and Support
OSD	Office of the Secretary of Defense

OT&E	Operational Test and Evaluation
PA&E	Program Analysis and Evaluation
PCA	Pre-Certification Authority
PDR	Preliminary Design Review
PEO	Program Executive Officer
PESHE	Programmatic Environment, Safety, and Occupational Health Evaluation
PGB	Program Governance Board
PIR	Post-Implementation Review
PM	Program Manager
PMW	Program Manager Warfare
PPBE	Planning, Programming, Budgeting, and Execution
PSA	Principal Staff Assistant
QDR	Quadrennial Defense Review
RAND	Research and Development
R&D	Research and Development
RFP	Request for Proposals
RICE	Reports, Interfaces, Conversions, Extensions
SaaS	Software as a service
SAE	Service Acquisition Executives
SDCI	Software Development and Commercial off-the-shelf (COTS) Integration
SDD	System Development and Demonstration
SECDEF	Secretary of Defense
SES	Senior Executive Service
T&E	Test and Evaluation
TIC	Test and Integration Capabilities
USC	United States Code
USD(AT&L)	Under Secretary of Defense (Acquisition, Technology and Logistics)

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I. INTRODUCTION

A. INFORMATION TECHNOLOGY ACQUISITION WITHIN THE DEPARTMENT OF DEFENSE

The Department of Defense (DoD) has leveraged information technology (IT) extensively in order to build national security systems, business systems, and weapons systems in the interest of National Defense objectives. The DoD continues to invest in IT capabilities and will continue to rely on IT systems in order to meet the challenges of twenty-first century warfare. IT acquisition is generally defined as the act of acquiring or gaining new technologies in order to meet a specified requirement and the Defense acquisition system is the method used by the DoD to acquire these new technologies. For the DoD, a successful IT acquisition project is defined as a project that is delivered on time and on budget with the required features or functions that are of the current IT product generation or current with regard to commercially available systems (Gansler & Lucyshyn, 2012).

The DoD seeks to acquire IT systems that meet requirements quickly and cost effectively; however, this endeavor has been very difficult to achieve given the cumbersome and deliberate process through which IT systems are acquired. Moreover, the traditional acquisition system cannot keep pace with the rapid development of information technology systems that occurs today. In 2009, a major study conducted by the Defense Science Board (DSB) concluded that the traditional DoD acquisition process, as described in DoD Instruction (DoDI) 5000.02, is too long and too cumbersome to meet the needs of the many IT systems that require continuous changes and upgrades (DSB, 2009).

For years, the DoD has relied on a common acquisition method, or a one-size-fits-all approach, for acquiring different systems and services. This singular approach has been laced with inefficiencies and inadequacies ranging from requirements generation and funding to oversight and management issues, all of which have contributed to prolonged schedules and increased cost. It is critical

that the IT acquisition process be improved in order to increase the effectiveness of employing new systems to meet requirements in a timelier manner. The DoD has earnestly made several attempts to revamp the acquisition system to decrease the acquisition cycle time; however, it appears that these changes have had little impact because the timeline remains long compared to the commercial sector. Commercial technology evolution cycles for new IT systems average 12 to 18 months but fielding of useful IT systems within the DoD can take an order of magnitude longer. For instance, a House Armed Services Committee in 2010 found that the delivery of systems required between 48 and 60 months (HASC, 2010). This is problematic since the commercial IT acquisition process takes approximately one-fifth of the time it takes the DoD, which results in the DoD's new IT systems being outdated even before they arrive to the end users. Therefore, the DoD has begun to implement a new IT acquisition process for IT systems designated as Defense business systems (DBS). This new IT acquisition process is referred to as the Business Capability Lifecycle (BCL) and it is considered a first step in responding to a congressional mandate to employ a new system. However, BCL does not resolve all IT acquisition issues due to shortfalls and potential problems such as its applicability across all IT acquisitions and funding methods used to acquire IT.

It is clear that the DoD intends to improve the IT acquisition system in order to acquire IT systems in a more timely manner, but what is unclear is how the DoD will do so, especially in the wake of projected defense budget cuts. This thesis will discuss the causes or impeding factors that prevent the DoD from acquiring new IT systems in an expeditious manner and will recommend alternative solutions to solving the problems. Also, this thesis will include a historical perspective of acquisition reform, a systematic look at the entire acquisition process, an analysis of the value of proposed solutions, and organizational change management theory as it relates to implementing new processes and procedures such as the new BCL IT acquisition process.

B. PROBLEM STATEMENT

This thesis seeks to address the DoD's acquisition process for acquiring new information technology (IT), which has been inadequate in keeping pace with the commercial industry's production of new technologies. This is a problem because as the IT acquisition cycle time increases, so does cost; but more importantly, benefits are slower to be received by the warfighter or the end-user. As a result, newer and potentially better technologies always are available first in the commercial industry and perhaps even to our adversaries.

C. PURPOSE STATEMENT

The purpose of this thesis is to explore and understand the issues involved in the DoD's acquisition process for information technology (IT) in order to recommend a new acquisition approach or solutions that are more conducive to keeping pace with the rapid IT development cycle found in the commercial industry. This study is important because the DoD increasingly depends on IT capabilities and IT is viewed as a capability that will provide the military with a competitive advantage in achieving information dominance.

D. POTENTIAL BENEFITS

The potential benefits that may result from this thesis are a better understanding of the problems within the DoD's IT acquisition system in order to offer feasible solutions or recommendations for resolving the problems. This thesis contributes to the DoD's efforts in resolving the issues that continue to undermine timely IT acquisition. DoD acquisition stakeholders could benefit from this research, as new approaches to the acquisition process will be explored.

E. RESEARCH METHODOLOGY

Several studies conducted since 2009 have warned of IT acquisition problems in regard to acquisition cycle-time, flexibility, and efficiency, and recommended reform efforts and improvements (e.g., development of a separate IT acquisition process). This thesis conducts a meta-analysis of this previous

research to identify common elements and acknowledged deficiencies in an effort to recommend further solutions.

F. BACKGROUND

In an effort to understand the significance of the IT acquisition issue before delving into the problems, the remainder of this chapter will present background information. This background information will provide an overview of the IT environment within the DoD, an explanation of the importance of IT within the Department as it relates to strategy, and it will provide an introduction to acquisition policy and the stakeholders involved.

1. Overview of the Information Technology Environment within the DoD

a. DoD Dependence on Information Technology Systems

Information technology (IT) has become ubiquitous across the Department of Defense (DoD) with a disparate set of uses and users. IT systems are used for a wide variety of purposes within the DoD forming an “information enterprise” as defined in DoD Directive 8000.01:

[The DoD Information Enterprise consist of] information resources, assets, and processes required to achieve an information advantage and share information across the Department of Defense and with mission partners. It includes: (a) the information itself and the Department’s management over the information lifecycle; (b) the processes, including risk management, associated with managing information to accomplish the DoD mission and functions; (c) activities related to designing, building, populating, acquiring, managing, operating, protecting, and defending the information enterprise; and (d) related information resources such as personnel, funds, equipment, and IT, including national security systems. (DoD Directive 8000.01, 2009)

Information is the key enabler of the Defense Enterprise as was identified specifically in the 2008 National Defense Strategy (NDS, 2008). The DoD and its military branches have taken full advantage of the capabilities afforded by new information technologies. The U.S. military, in particular, has been enhanced in

its capabilities due to the profound advances in IT for weapons systems. Among other things, the DoD has greatly benefited in the areas of management and the overall operations of the Defense Enterprise. To gain these important capabilities, a significant portion of the DoD budget is spent each year on acquiring these relentlessly advancing technologies in order to support a broad range of warfighting and functional applications (NRC, 2010). The ability of the DoD and its industry partners to harness and apply advances in IT for command, control, and communications; logistics; and transportation has contributed enormously to making the United States' military the best in the world.

So pervasive is IT that it has become an essential part of the U.S. National Defense Strategy. From infrastructure to business systems to IT embedded in weapons systems, the DoD is completely dependent on information technology. While the importance of IT continues to expand, the information technology environment is experiencing disturbing trends that have exacerbated the issues within the IT acquisition process. Figure 1, taken from the 2009 Defense Science Board Report on IT acquisition, depicts growing trends within the information technology environment that show an increase in IT complexity, foreign supply, vulnerabilities, threats, and cost with an associated decrease in the supply of U.S. computing graduates and qualified expert government staff (DSB, 2009). This occurrence is considered a "perfect storm" in regard to information technology acquisition because it further exacerbates IT acquisition issues. Additionally, as these issues occur, the rate of technology change continues to increase as well as the interconnectedness of systems, which pose additional risks for the DoD.

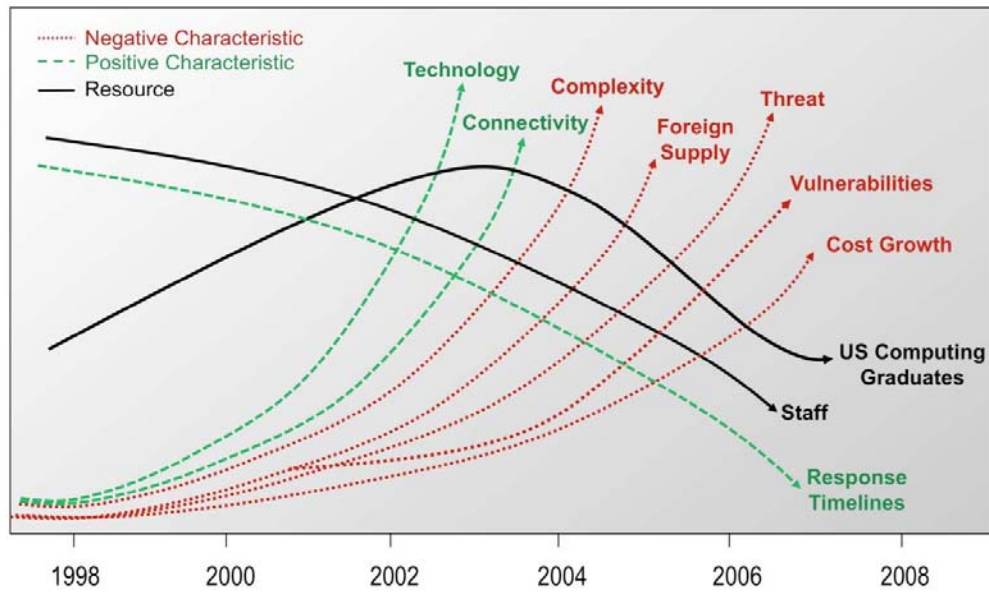


Figure 1. The Perfect Storm (From DSB, 2009)

b. Information Technology as Defined by the DoD

For the purposes of this study, it is important to understand how the DoD defines information technology. Over the years, information technology has been defined in slightly different ways. As it is defined in the 1996 Clinger Cohen Act, formerly known as the Information Technology Management Reform Act,

the term “information technology”—

(A) with respect to an executive agency means any equipment or interconnected system or subsystem of equipment, used in the automatic acquisition, storage, analysis, evaluation, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the executive agency, if the equipment is used by the executive agency directly or is used by a contractor under a contract with the executive agency that requires the use—

(i) of that equipment; or

(ii) of that equipment to a significant extent in the performance of a service or the furnishing of a product;

(B) includes computers, ancillary equipment (including imaging peripherals, input, output, and storage devices necessary for security and surveillance), peripheral equipment designed to be controlled by the central processing unit of a computer, software, firmware and similar procedures, services (including support services), and related resources; but

(C) does not include any equipment acquired by a federal contractor incidental to a federal contract. (Clinger Cohen Act, 1996)

This definition outlines IT in its broadest sense. IT can be generally defined as any system or subsystem of hardware or software whose purpose is to acquire, process, store, or communicate data or information (DSB, 2009). Also, IT can be defined as those systems that support the DoD information enterprise, especially those systems expected to run on or interface with existing infrastructure, systems that are user-facing, and is limited to those that are delivered through the acquisition process and not systems developed by individual commands (DSB, 2009). For the purposes of this study, IT is defined as any computer hardware or software system whose purpose is to acquire, process, store, or communicate information.

c. The Rapid Advancement of Information Technology

The DoD has not been able to keep pace with the rapid advancement in IT due to the ineffectiveness of the IT acquisition system. Information technology, both software and hardware, continues to rapidly advance as postulated in 1965 by Gordon E. Moore, co-founder of Intel. Moore (1965) predicted that the number of transistors on an integrated circuit board would increase at a rate of roughly a factor of two per year; he later refined his projection to a doubling every 2 years (DSB, 2009). This happening is referred to as Moore's Law. Moore's Law describes an exponential growth in technology advancements in such areas as computer processing speed and memory capacity. For example, software and hardware have advanced at a very fast rate over the past several decades, from isolated standalone computing systems in

the middle of the twentieth century to networked systems that span the globe today, these IT advancements have been transformational.

With rapid technology change, we are experiencing a rapid global increase in connectivity among computers and, consequently, among people (DSB, 2009). Also, the spread of information technology has shifted the roles of citizen and state. New information technologies such as mobile devices and cheap digital storage devices have provided individuals and groups with unprecedented capabilities to organize and collaborate in new ways. Moreover, the Internet, social networking, on-line search engines, video teleconferencing, and multimedia-enabled smart-phones are but a sample of IT-based capabilities that have altered the ways in which people communicate (NRC, 2010). The capability the DoD possesses through information technology is apparent and its uses have never been more significant. In fact, DoD IT systems cover a broad range of diverse technologies, domains, missions, and customers. This broad range includes support to National Security Systems (NSS), operational processes, and infrastructure (see Figure 2).

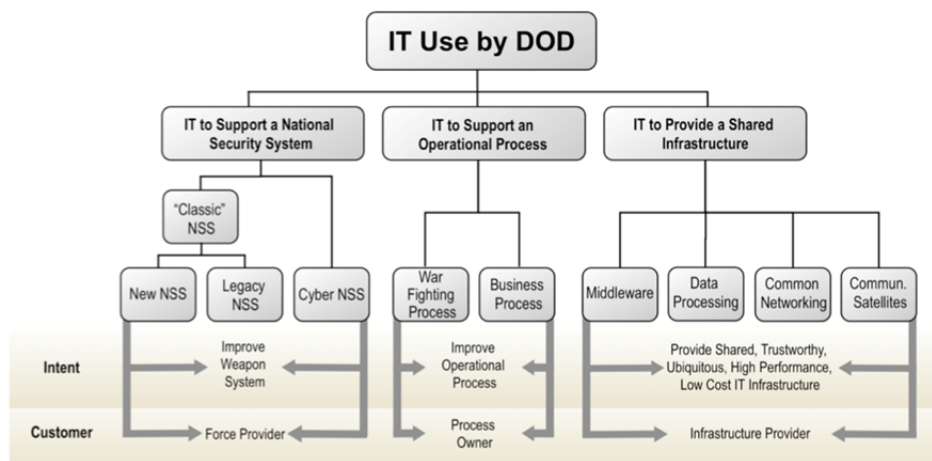


Figure 2. DoD IT Framework (From DSB, 2009)

2. Importance of Information Technology to the DoD

a. The Advent of the Information Age and Information Revolution

The Information Age and the Information Revolution have brought with it a plethora of personalized products and services and a powerful combination of centrally supported IT and end-user-driven IT, which have changed how we as a nation do business. This has resulted in an empowerment of individuals and organizations, giving them the ability to innovate their technical capabilities and their business processes (NRC, 2010). At the same time, the IT revolution of the past 20 years—everything from hardware and software, data standards, and commonly agreed-upon architectural frameworks—has completely permeated the national security enterprise. Like the business world, the DoD runs on information and seeks to gain an information advantage. Information technology systems not only underpin the business practices and management of the Department, but they have become integral to advanced weapons systems such as laser-guided munitions and global positioning devices.

The importance of information technology to military capability is inestimable. IT has enabled nearly all of the military's combat capability and has become a necessary element of critical warfare systems, warfare support systems, and Defense business systems. This study focuses on IT acquisition as it relates to Defense business systems (DBS). The term "Defense business system" is defined as an information system, other than a national security system, operated by, for, or on behalf of the Department of Defense for activities such as acquisition, financial management, logistics, strategic planning and budgeting, installations and environment, and human resource management (USD[AT&L], 2008). The designation of "business system" may give the impression that these systems only relate only to administrative-type operations; however, these systems have a direct impact on warfighting capability. For instance, all military operations are inherently dependent on logistics support systems, and, consequently, the business systems that support logistics

functions are considered Defense business systems (Gansler & Lucyshyn, 2012). Also, IT plays a significant role in national security systems. According to the Clinger Cohen Act of 1996, a national security system is defined as:

A telecommunications or information system operated by the federal government, the function, operation, or use of which:

- (A) involves intelligence activities;
- (B) involves cryptologic activities related to national security;
- (C) involves command and control of military forces;
- (D) involves equipment that is an integral part of a weapon or weapons system; or
- (E) is critical to the direct fulfillment of military or intelligence missions. Does not include a system to be used for routine administrative and business applications (including payroll, finance, logistics, and personnel management applications). (Clinger Cohen Act, 1996)

Thus, national security systems include satellites, missiles, tanks, ships, and planes where IT is embedded within the system. IT touches a wide range of Department systems and, in turn, enables a wide range of capabilities.

b. Information Technology as it Relates to Military Strategy

Technological advancements have created a new world for military operations. This new world began to take shape at the turn of the century when the DoD developed a military transformation strategy referred to then as Network Centric Warfare (NCW). The IT acquisition is important to NCW strategy because the strategy relies heavily on information technology being available. Furthermore, the net-centric strategy is a capability that provides the DoD with a competitive advantage, which is essential to conducting twenty-first century warfare in the Information Age. This new strategy was important to DoD's transformation into the Information Age and remains important today. To gain an appreciation of the significance and the urgency of solving IT acquisition issues within the DoD, it is necessary to understand why IT is so important to the

Department and how an effective military strategy is closely tied to an effective IT acquisition system.

c. *The DoD's Net-Centric Strategy*

In the late 1990s, the Department of Defense (DoD) began a force transformation initiative in order to advance the military into the Information Age. This initiative was facilitated by the advent of new technologies and the need to achieve information superiority against an adversary. The concept was referred to as Network Centric Warfare (NCW) but is now referred to as net-centric capabilities or net-centric operations. The concept of NCW has been defined in different ways throughout its history, but all the definitions share similarities. In its broadest definition as provided by the Command and Control Research Program (CCRP) in its 1999 publication, *Network Centric Warfare: Developing and Leveraging Information Superiority*, NCW is defined as:

An information superiority-enabled concept of operations that generates increased combat power by networking sensors, decision makers, and shooters to achieve shared awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization. (Garstka & Stein, 1999)

In other words, the NCW strategy is characterized by the linking of people, platforms, weapons systems, sensors, and decision aids into a single networked environment (DoD OFT, 2005). The NCW theory is further defined in terms of its four tenets that describe the enhanced power of a networked force: (1) a robustly networked force improves information sharing, (2) information sharing enhances the quality of information and shared situational awareness, (3) shared situational awareness enables collaboration and self-synchronization, and (4) these, in turn, dramatically increase mission effectiveness (DoD, 2001).

Network Centric Warfare (NCW) was the cornerstone of the DoD's transformation process, and the Department placed great emphasis on the capabilities produced by this strategy. In fact, much had been accomplished in

the era of NCW including the development of newer technologies and systems, the creation of new military occupational specialties (MOS) and departments (i.e., the Office of Force Transformation, now defunct). The biggest accomplishment has been the impact on operations. According to the 2006 Quadrennial Defense Review (QDR), operational experiences in both Iraq and Afghanistan have demonstrated the value of network centric warfare (DoD, 2006). In both theaters of war, critical relationships were enabled via network-centric capabilities that allowed for faster operational decision making. By harnessing the power of information through connectivity, operating forces were able to gain greater situational awareness and show the value of NCW. General Stanley A. McChrystal (2010), former Commander of International Security Assistance Force (ISAF) and U.S. Forces Afghanistan, credited network centric theory in his review of the progress experienced in Iraq and Afghanistan (Yunker, 2010). Furthermore, the special operations mission that targeted Osama bin Laden exemplified aspects of the NCW strategy in its speed and agility, collaboration with higher headquarters, decentralization of the small unit, and decisive speed in accomplishing the mission (Elkus, 2011). These recent combat experiences highlight the importance of IT systems with its ability to fuse data from broad ranges of sources both within and outside of the DoD.

Although there has been some success in using the net-centric strategy, it has also had its problems. According to the Defense Science Board (DSB) (2009) in reference to a 2006 DSB study regarding information management for net-centric operations:

Information management in Iraq and Afghanistan was a principal concern among warfighters. Significant ad hoc activity was taking place, especially at the tactical level, to gain desired capability. To counter the interoperability problem, many approaches were used to move information from one stove-pipe to another...much of the military capability used to support the conflicts was paid for with supplemental funding—programs that were not part of the Department's planned capability. This circumstance reflects the fact that the need for such programs could not be predicted during previous core program and budget planning, and the system was

not sufficiently agile to react once the need was apparent. (DSB, 2009)

These problems experienced in combat were due in large part to not having the right systems in place to better manage information but was also due to the ineffective acquisition process that was in use to facilitate warfighter needs and requirements. Despite these problems, much has been written on the advantages and benefits resulting from the net-centric strategy and the promise it holds for the future. However, the implementation of the net-centric strategy has not come without challenges, which have served to stymie full integration of the strategy.

Some of these challenges to implementing the net-centric strategy can be linked to the ineffectiveness of the IT acquisition system. The DoD's overall strategy for implementing NCW theory was based on three principles. The first principle involved setting priorities to enable, develop, and implement net-centric concepts and capabilities. These priorities encompass networking a critical mass of the Joint Force, an increased emphasis on research in developing situational awareness and approaches to achieving synchronization, and research to improve the DoD's ability to accurately represent net-centric related concepts in models and simulations (DoD OFT, 2005). The second principle consisted of establishing specific goals and measuring progress. The DoD recognized the importance of establishing measurable goals to assess progress and validate the utility of the net-centric strategy. The third principle consisted of overcoming any impediments to progress. It is this principle that has not been effectively adhered to because an impediment to progress is in the failure to acquire IT systems in a timely manner in order to meet mission requirements. Thus, the net-centric strategy has not been fully realized in the years since its inception due to a number of issues including acquisition related problems. As described in the Defense Science Board's 2009 report to Congress, failures within IT acquisition have roots in the failure to fully realize the vision of the DoD's transformation strategy:

Certainly, barriers that preclude transformation of the U.S. national security apparatus to meet the challenges of a new strategic era are of particular concern. Nearly a decade ago the Department established a vision for the architecture and structure for information system management—a vision that is still evolving. However, it is well known that acquisition has not been well managed for these systems within this “enterprise level” construct, and the result has not served today’s leaders and soldiers well. In fact it hinders the warfighters’ ability to use information technology to its fullest potential for situation awareness, collaboration, and rapid decision-making. The resulting operational impact is profound. (DSB, 2009)

With warfare now being waged in the Information Age, the DoD may be at risk of losing its competitive advantage of information superiority if IT acquisitions do not enable the full implementation of the net-centric strategy. Failure to implement this strategy may reduce the DoD advantages in conducting twenty-first century warfare and place the military at a disadvantage, especially in cyberspace. The 2010 Quadrennial Defense Review (QDR) speaks specifically about how operating effectively in cyberspace for the security environment demands improved capabilities to counter cyber threats. Furthermore, modern armed forces simply cannot conduct effective high-tempo operations without resilient, reliable information and communication networks and assured access to cyberspace (Daggett, 2010). Therefore, it is imperative that the DoD work to resolve all impediments to acquiring newer technologies in order to maintain information superiority in warfare.

The war on terrorism over the past decade has shown us that national security threats can come from many diverse areas including domestic and international terrorists groups, state/non-state actors, computer hackers, and others. It is clear that terrorist groups and other non-state actors have come to characterize warfare and conflicts in the twenty-first century, and their continued growth and power will remain a key issue of the information environment. Due to globalization, there has been a transformation of the process of technological innovation due to the lowering of entry barriers for a wider range of actors and potential adversaries to develop and acquire advanced technologies (Daggett,

2010). Adversaries around the world are acquiring these new technologies and are potentially gaining an advantage as we fail to acquire newer technologies in an effective and timely manner. The speed with which potential adversaries can adapt, procure, and employ newer capabilities against the United States has been impressive. Moreover, our adversaries are better able to manipulate the information environment by employing a challenging mix of tactics and technologies, which will increasingly be an important part of the future spectrum of conflict (Daggett, 2010).

According to the DoD Chief Information Officer, Teresa Takai, “U.S. networks are under constant attack from cyber security threats launched from the Internet or from malicious software embedded in e-mail attachments, removable media, or even embedded in the hardware the Department procures” (Improving Management and Acquisition of Information Technology Systems in the Department of Defense, 2011). Takai goes on to state that, “every single device connected to the network is susceptible to a cyber attack” (Improving Management and Acquisition of Information Technology Systems in the Department of Defense, 2011). This is especially concerning because the DoD is constantly striving to integrate and network more and more systems, so we are even more susceptible.

Leveraging information technology to deliver mission-critical information capabilities to warfighters is one of the primary goals of IT. There was a time when the DoD sought to balance the need to know with the need to share information; however, today the warfighter expects to have and needs to have the latest information in order to accomplish the mission (Improving Management and Acquisition of Information Technology Systems in the Department of Defense, 2011). The need to know the latest information, coupled with the increasing use of the latest technologies from smart phones to mobile computers, has made information-sharing an expectation. Thus, this expectation requires new capabilities, especially in tactical environments. IT offers inestimable capability and has been leveraged extensively in order to build national security

systems, business systems, and weapons systems. As the Department continues its transformation to meet the challenges of the twenty-first century, it will continue to rely on the increased functionality that IT provides, so acquisition processes have to be made more effective. Thus, the continued implementation of net-centric capabilities via effective IT acquisition is of the utmost importance in continuing the transformation process within the DoD.

3. Acquisition of Information Technology within the DoD

a. Information Technology Expenditures within the DoD

The DoD is an immensely large and complex organization that consists of the Office of the Secretary of Defense (OSD), the Joint Chiefs of Staff (JCS), the military departments, numerous defense agencies and field activities, and various unified combatant commands. With this much manpower, the DoD is the largest organization in the world, with operations that span a broad range of agencies, activities, and commands. Furthermore, the DoD is the nation's largest employer with over 1.4 million military personnel on active duty, more than 750,000 civilian personnel, and over one million serving in the National Guard and Reserve (DoD, 2010). Additionally, there are nearly 6 million military family members and retired personnel who receive benefits.

According to a 2010 Government Accountability Office (GAO) report regarding DoD business transformation, "in fiscal year 2009, DoD reported that its operations consisted of \$1.8 trillion in assets, \$2.2 trillion in liabilities, approximately 3.2 million military and civilian personnel and disbursements of over \$947 billion" (GAO, 2010). Of course, this 2009 budget may not rival future defense spending given the current fiscal situation within the federal government, but these figures point out the large sums of money spent within the DoD and a significant portion of these expenditures are used for acquiring information technology.

Much like the commercial business world, the DoD runs on information and continues to require more and more of it via IT systems in order

to achieve an information advantage. In an effort to support the diverse IT requirements of the DoD's huge population, the DoD employs approximately 15,000 unclassified networks, more than seven million computers and associated IT devices, and a 170,000-person information management and information technology workforce (DoD, 2010). With these large numbers of systems, it is clear that information technology is a crucial factor in every aspect of the DoD's activities. From routine e-mail to the weapons control systems in the most sophisticated ships in world, the DoD depends on the smooth functioning of a myriad of IT systems and the acquisition process that provides them.

As the Information Age advances, we find that IT systems have expanded both in complexity and in pervasiveness and as a result, they represent one of the largest investments for the DoD today. For example, the GAO, which is the investigative arm of the federal government, reported that in fiscal year 2011 the DoD allotted approximately \$36.6 billion for its IT investments and \$5.6 billion of this amount was allotted for major automated information system (MAIS) programs that the DoD required in order to sustain key operations (GAO, 2013). The millions of people who are employed by the DoD operating worldwide maintain an inventory of systems and services that accounts for these expenses and it is an order of magnitude larger than any IT expense in the world. The DoD's IT acquisition expenditures in comparison to other DoD expenditures are relatively small but they constitute an extremely important business function within the Department. However, there are growing concerns involving all DoD expenditures due to government fiscal issues and projected decreases in the DoD budget. As a result, IT acquisition issues, especially the IT funding process issue that will be discussed in Chapter II, will only be exacerbated in the event of budget cuts.

b. Acquisition Policy within the DoD

The purpose of the Defense acquisition system in the DoD is explained in this excerpt from DoD Directive (DoDD) 5000.01, and understanding this sets the foundation for this study:

The Defense Acquisition System exists to manage the nation's investments in technologies, programs, and product support necessary to achieve the National Security Strategy and support the United States Armed Forces. The investment strategy of the Department of Defense shall be postured to support not only today's force, but also the next force, and future forces beyond that. The primary objective of Defense acquisition is to acquire quality products that satisfy user needs with measurable improvements to mission capability and operational support, in a timely manner, and at a fair and reasonable price. (USD[AT&L], 2007)

The emphasis of this thesis relates to the objective of acquiring IT “in a timely manner”; however, the other objectives of quality products and reasonable pricing are equally important in a DoD IT acquisition program. A DoD acquisition program is generally defined as a directed, funded effort that provides a new, improved, or continuing materiel, a weapon or information system, or a service capability in response to an approved need or requirement shortfall (USD[AT&L], 2007). The Defense acquisition system is a management process used to provide effective, affordable, and timely systems (USD[AT&L], 2007). Additionally, the acquisition process includes designing, engineering, testing and evaluating, production, and operations and support of Defense systems (Brown, 2010). As used herein, the term “IT acquisition” will apply only to information technology systems, processes, procedures, services, and end products that do not include weapons systems with embedded IT (e.g., IT that provides the control systems of aircraft weapons platforms). For this study, IT acquisition will only refer to military-unique applications that support intelligence, logistics, command and control, and services that provide basic desktop computing and other infrastructure support. Also, this study refers to the acquisition of major automated information systems (MAIS) that are associated with the performance

of routine administrative and business tasks such as payroll, accounting functions, and logistics (Brown, 2010).

For many years, information technology acquisition has been a subset of the larger acquisition policy within the DoD. In fact, DoD's acquisition policies and regulations were primarily designed to meet the needs of large weapons programs (NRC, 2010). In the past, it has taken significant tailoring to accommodate IT programs due to acquisition instructions focusing almost exclusively on weapons system acquisition and on Major Defense Acquisition Programs (MDAPs) such as ship and aircraft procurement. The strategic guidance used to shape the entire Defense acquisition program can be found in the department's acquisition policies and regulations.

The two major DoD regulatory documents that guide the management of Defense acquisition are captured in two documents: DoD Directive (DoDD) 5000.1, "The Defense Acquisition System," and DoD Instruction (DoDI) 5000.2, "Operation of the Defense Acquisition System." DoDD 5000.01 provides a basic set of definitions and three overarching policies that govern the Defense acquisition system: flexibility, responsiveness, and innovation; while DoDI 5000.02 intends to establish a simplified and flexible management framework for translating mission needs and technological opportunities into stable, affordable, and well-managed acquisition programs (NRC, 2010). Also, DoDI 5000.02 intends to establish a general approach for managing all defense acquisition programs (NRC, 2010). Although DoDI 5000.02 has good intentions, the instruction does not effectively support the acquisition of IT systems. In fact, both DoDD 5000.01 and DoDI 5000.02 focus almost exclusively on weapons system acquisition and on MDAPs; however, DoDI 5000.02 contains one short section on IT acquisition found in Enclosure 5, which consists of only 3 pages in the 80-page document. This fact leads into an acquisition problem area regarding the inattention to IT specific acquisition, a fact that will be discussed later.

The oversight of the acquisition system is an essential and important part of the acquisition process and this oversight is grouped into three

major decision-support systems: the Joint Capabilities Integration and Development System (JCIDS); the Defense Acquisition System; and the Planning, Programming, Budgeting and Execution (PPBE) process. These decision-support systems will be discussed in Chapter III but a general description of each one is as follows:

The Joint Capabilities Integration and Development System is the system that identifies and documents warfighter needs or requirements (i.e., mission deficiencies or technological opportunities); the Defense Acquisition System, establishes a management framework for translating the needs of the warfighter and technological opportunities into reliable, affordable, and sustainable systems; and the Planning, Programming, Budgeting and Execution Process prescribes the process for making decisions on funding for every element of the Department, including acquisition programs. (Brown, 2010)

Additionally, the oversight process employs a layered approach to oversight, which is based on the level of investment or how much funding is provided to a program (DSB, 2009). All programs are generated at the component level along with the program requirements. Many programs are reviewed at the origin by designated component milestone decision authorities (MDAs). The most significant investments, programs categorized as major automated information systems (MAIS), receive additional review within the Office of the Secretary of Defense (OSD) (DSB, 2009). Also, there is congressional oversight, which will be discussed further in the next section.

For purposes of program management, all Defense acquisition programs are broken down into different acquisition categories (ACATs). Each ACAT level is based on the type of acquisition desired, its dollar value, and the level of milestone decision authority (MDA) it rates. MDA is the action of approving or disapproving program progress or advancement into follow-on phases. There is a chain of authority along with organizational players who are intimately involved at each ACAT level. ACAT designations for automated information systems (AIS) involve systems of computer hardware, software, data, or telecommunications that perform functions such as collecting, processing,

storing, transmitting, and displaying information; excluded are computer resources that are a part of a weapons systems (Brown, 2010). Figure 3 displays ACATs for IT.

Category	Criteria for Designation	Decision Authority
ACAT IA	<ul style="list-style-type: none"> Major Automated Information System (MAIS) <ul style="list-style-type: none"> Designated by the MDA as an MAIS, or Estimated to exceed: <ul style="list-style-type: none"> Program costs in any single FY (all appropriations), \$32M, or Total program costs (all appropriations) from beginning of Concept Refinement through deployment at all sites, \$126M, or Total life cycle costs (all appropriations), \$378M MDA designation as special interest 	<ul style="list-style-type: none"> ACAT IAM: <ul style="list-style-type: none"> USD(AT&L) or designee Reviewed by the Information Technology Acquisition Board ACAT IAC: Component head, or Component Acquisition Executive (CAE) (cannot be further delegated) <ul style="list-style-type: none"> Reviewed by component HQ
ACAT II	<ul style="list-style-type: none"> Does not apply to MAIS programs 	<ul style="list-style-type: none"> N/A
ACAT III	<ul style="list-style-type: none"> Does not meet ACAT IA (MAIS) criteria 	<ul style="list-style-type: none"> Designated by the CAE at the lowest appropriate level Reviewed in accordance with component policy

Figure 3. Acquisition Categories for IT (amounts in FY2000 constant dollars)
(From Brown, 2010)

Major automated information system (MAIS) acquisition programs are designated ACAT IA programs. There are two subcategories of ACAT IA programs, which are as follows:

- ACAT IAM, for which the milestone decision authority is the USD(AT&L) or, if delegated, the Assistant Secretary of Defense for Networks and Information Integration. The “M” refers to major automated information systems reviewed by the Information Technology Acquisition Board.

- ACAT IAC, for which the milestone decision authority is delegated to the component. The “C” refers to component. After the appropriate headquarters review, the Component Acquisition Executive (CAE) makes the final milestone decision.
- The ACAT II designation does not apply to automated information systems. ACAT III automated information systems are those that do not meet the criteria for ACAT IA. (Brown, 2010).

c. Defense Acquisition Management: Key Personnel and Oversight

There is a chain of authority and many organizational players who are involved at each ACAT level and throughout the acquisition process. Currently, acquisition authority and expertise within the DoD is spread across different organizations, which is problematic; and a matter that will be discussed in detail later. According to DoD Directive 5134.01, the primary management agency of the DoD Acquisition System is the Under Secretary of Defense for Acquisition, Technology and Logistics (USD[AT&L]) who is currently Mr. Frank Kendall (DoD, 2008). The USD(AT&L) is the principal staff assistant and advisor to the Secretary of Defense and Deputy Secretary Defense for all matters concerning acquisition, technology, and logistics (“Office of the Under Secretary of Defense for Acquisition, Technology and Logistics,” n.d., Welcome To AT&L section, para. 1). The primary responsibilities of the USD(AT&L) include supervising DoD acquisition; establishing policies for acquisition (including procurement of goods and services, research and development, developmental testing, and contract administration) for all elements of the Department; and establishing policies for the DoD for maintenance of the Defense industrial base of the United States (“Office of the Under Secretary of Defense for Acquisition, Technology and Logistics,” n.d., Welcome To AT&L section, para. 1). The USD(AT&L) also serves as the Defense Acquisition Executive (DAE) and Milestone Decision Authority (MDA) for ACAT IA programs as identified in Figure 3 under Decision Authority.

Two other OSD-level organizations or offices are integral to the IT acquisition process: the DoD Chief Information Officer (formerly the Assistant Secretary of Defense [Networks and Information Integration/DoD CIO]) and the Office of the Deputy Chief Management Officer (ODCMO) for the DoD. Due to fiscal concerns, the Assistant Secretary of Defense for Networks and Information Integration (ASD[NII]), who was the principal OSD staff assistant for the development, oversight, and integration of DoD policies and programs relating to the strategy of information superiority, was dissolved into other DoD departments (“DoD News Briefing with Secretary Gates from the Pentagon,” 2010). The ASD(NII) was dual-hatted and served as the Chief Information Officer of the Department. The DoD CIO is the Principal Staff Assistant (PSA) and advisor to the Secretary of Defense (SECDEF) and Deputy Secretary of Defense (DEPSECDEF) and is tasked with improving the combat power of the Department by ensuring that the Department treats information as a strategic asset and that innovative information capabilities are available throughout all areas of DoD supporting warfighting, business, and intelligence missions (“DoD CIO Mission,” n.d.). The DCMO is responsible for synchronizing, integrating, and coordinating the business operations of the Department and ensuring optimal alignment in support of the warfighting mission (“About DCMO,” n.d., About DCMO section, para. 1). These two DoD agencies and the USD(AT&L) comprise the power structure of the DoD acquisition system; however, there are many other entities that play important roles and also hold considerable power.

Other important entities in the acquisition process involve the Component Acquisition Executive (CAE), the Program Executive Officer (PEO), and the Program Manager. The CAE is the senior official in each DoD component who is responsible for acquisition matters (Brown, 2010). Normally, the CAE serves in a primary duty capacity as either the secretary of the military department or as the head of the Defense agency. In the case of military departments, the secretaries may delegate this responsibility to the assistant secretary level, which is then referred to as the Service Acquisition Executives

(SAE) (Brown, 2010). The PEO is normally a general officer but can also be a Senior Executive Service (SES), which is a civilian equivalent. The PEO is responsible for first-line supervision of a group of like programs and each managed by separate Program Managers (PM) (Brown, 2010). Last, and certainly not least, is the Program Manager (PM).

The PM is arguably the most significant person in the acquisition process, not necessarily for possessing a lot of power but due to his or her proximity to the project. The PM is the designated individual with responsibility for and authority to accomplish program objectives. These objectives include development, production, and sustainment to meet the user's operational needs (DoDD 5000.01). Ultimately, the PM is accountable for what is considered the holy trinity of any program or project: cost, schedule, and performance. If the PM is not knowledgeable, experienced, and consistent in terms of his or her availability throughout a program, the IT acquisition process is more likely to experience problems. Unfortunately, issues surrounding the IT acquisition workforce, to include the PM, have caused problems, which will be discussed in more detail later.

There are many other DoD agencies, organizations, and stakeholders along with several other offices within the Executive Branch that are involved in the acquisition process. In no particular order, these entities include the following:

- IT Acquisition Advisory Council
- Overarching Integrated Product Teams (OIPTs) which are specialized review teams
- Investment Review Board (IRB)
- Chief Information Officers (CIO) for the military departments
- Program Analysis and Evaluation (PA&E)
- Director of Defense Research and Engineering (DDR&E)
- Operational Test and Evaluation (OT&E)

- Office of Management and Budget (OMB)
- Office of Federal Procurement Policy (OFPP)
- Federal Acquisition Regulations Council
- Comptroller
- Operational users and other stakeholders (Brown, 2010)

All these different entities, plus the three main OSD-level organizations and/or personnel, comprise the management and acquisition team or acquisition workforce for the entire DoD IT acquisition system. The three main entities provide a line of authority in the acquisition process that runs from the USD(AT&L), through the CAE and PEO to the individual PMs of the ACAT IA programs (Brown, 2010).

With all the different agencies and organizations involved in the acquisition process, it can be very difficult to get anything done as planned or as scheduled. But, there unto lies the problem because IT acquisition does not always get done according to plan or schedule and acquisition workforce issues are just one of the problems. Despite the DoD's success in leveraging IT across the defense enterprise, the acquisition of IT systems continues to be burdened with problems that result in a failure to meet the primary objective of Defense acquisition which again is "to acquire quality products that satisfy user needs with measurable improvements to mission capability and operational support, in a timely manner, and at a fair and reasonable price" (USD[AT&L], 2007). The next chapter begins the discussion of the crux of this study, which will explore the problems that have plagued the Defense acquisition system over the past decade.

G. ORGANIZATION OF THESIS

The thesis is organized within five chapters. Chapter I is an introduction to the problems within the IT acquisition system and details the framework for this study. Also, Chapter I discusses the importance of IT and IT acquisition within the DoD in order to achieve national defense objectives. Chapter II consists of a thorough literature review of the acquisition research conducted since 2009: government reports, academic papers, and proposed strategies for reforming the IT acquisition system. Chapter III discusses background information on IT acquisition reform efforts and an overview of the current DoD acquisition systems. Chapter IV presents an analysis of both benefits and shortfalls of the current IT acquisition process and looks at other potential solutions, offering a recommended approach to IT acquisition. Finally, Chapter V closes the study with persisting issues in connection with the current IT acquisition system, a summary, findings and recommendations, and conclusion.

II. LITERATURE REVIEW

This chapter consists of a thorough review of the information technology (IT) acquisition literature that has been written since 2009. This literature will include government reports, articles, academic papers, and other documents. The goal of this chapter is to provide the reader with an understanding of all the major problems surrounding IT acquisition within the DoD. These IT acquisition problems consist of a misalignment of the Defense Acquisition System to IT development, lengthy developmental timelines, testing and evaluation issues, legislative impediment and oversight, requirements and funding issues, and acquisition workforce and management related issues. Ultimately, this chapter will provide an extensive look at these problems to provide a context in order to set the reader up to begin a study of possible solutions which will be discussed in Chapters III through V.

A. PROBLEMS WITHIN THE DOD IT ACQUISITION SYSTEM

Information technology has been used in virtually all types of organizations, especially government and business organizations. To facilitate dealing with the complex tasks and business operations of the twenty-first century, commercial businesses and government agencies utilize networked IT systems such as Enterprise Resource Planning (ERP) and Supply Chain Management integration in order to enhance their operations. However, commercial businesses (e.g., FedEx and Wal-Mart) have successfully undergone a fundamental transformation of their business practices via information technology while government agencies have been less successful doing so and are still in the process of transformation (Gansler & Lucyshyn, 2012).

Government agencies such as the DoD have not been able to leverage the full potential that IT systems offer in regard to productivity. In fact, the DoD continues to lag far behind the capabilities demonstrated within the private sector (Gansler & Lucyshyn, 2012). The DoD's "lagging behind" is directly linked to the

issues found within the IT acquisition system today. These issues present a significant problem because as the IT acquisition processing times increase, so does costs; but more importantly, benefits are slower to be achieved. With that, there has been growing concern among the DoD and Congress that our nation's military advantage may be eroding due to the problems and inefficiencies within the IT acquisition system. It is important now to take an extensive look at what constitutes the problem or problems with the DoD IT acquisition system.

There have been no shortages of studies, reports, and reviews that have identified many of the problems that have plagued the DoD IT acquisition system. Thus, there is a recognized and compelling need to address these problems, bottlenecks, and discontinuities within the system. This review of the IT acquisition problems will analyze the following six documents, which include government reports, hearings, articles, and academic papers that have described the IT acquisition problems over the past several years:

- Defense Science Board Task Force on DoD Policies and Procedures for Acquisition of IT (DSB, 2009)
- Rapid IT Acquisition: A New Model for Acquiring Government Information Technology (Gilligan, Heitkamp, & McCoy, 2009)
- Achieving Effective Acquisition of Information Technology in the Department of Defense (NRC, 2010)
- House Armed Services Committee Panel on Defense Acquisition Reform Findings and Recommendations (HASC, 2010)
- A New Approach for Delivering Information Technology Capabilities in the Department of Defense (DoD, 2010)
- IT Acquisition: Expediting the Process to Deliver Business Capabilities to the DoD Enterprise (Gansler & Lucyshyn, 2012)

The authors of these various publications place similar yet different emphasis on what they construe as the problem or problems within the IT acquisition system but all have ended with the same conclusion that these problems need to be resolved in order to make the IT acquisition system more timely and effective. Overall, the problems identified all affect the three things

that are most important to any acquisition program: cost, schedule, and performance. Every information technology acquisition program's goals are to get the project done within an assigned budget and on time while providing end users with the required capabilities. Of these three program goals, which are all important, this study will focus on the scheduling goal because scheduling issues are directly related to DoD agencies and the warfighters getting needed capabilities in a timely manner in order to accomplish their specific missions. Also, scheduling issues have a direct impact on cost, which in this current fiscal environment of reduced Defense budgets is of the utmost importance. Performance, however, is a separate issue all together and will not be discussed in great detail but it will be discussed as it relates to schedule.

Of the six documents reviewed, the 2009 Defense Science Board's *Department of Defense Policies and Procedures for the Acquisition of Information Technology* is a seminal work dealing with problems in DoD IT acquisition. In fact, the problems in the IT acquisition system were not made a priority until this report was published. All of the other documents reviewed here expand from the issues made relevant by the DSB report. IT acquisition problems, as described in the literature, fall into six categories or problem areas that are as follows:

- The Defense Acquisition System Ill-suited for IT Acquisition
- Issues Extending From Lengthy Acquisition Timelines
- Testing and Evaluation Issues
- Legislative Impediment and Oversight Issues
- Requirements and Funding Issues
- Acquisition Workforce and Management Issues

B. THE TRADITIONAL DEFENSE ACQUISITION SYSTEM ILL-SUITED FOR IT ACQUISITION

As stated by the authors of *Rapid IT Acquisition: A New Model for Acquiring Government Information Technology*, “Information Technology tends to have different characteristics from many other items the government acquires, which means that the typical government acquisition processes are not optimum for IT procurements (Gilligan, Heitkamp, & McCoy, 2009). The authors go on to state that “lengthy and deliberate processes used to acquire weapons systems in DoD, Coast Guard ships for the Department of Homeland Security, or a nuclear fusion test laboratory for the Department of Energy would not be good models for acquiring tax payment processing systems or law enforcement fugitive databases” (Gilligan et al., 2009). Information technology acquisition differs from other types of procurements in a few ways. As outlined by Gilligan, Heitkamp, and McCoy (2009), the underlying differences in IT that distinguishes it from other types of procurements, products, and services are as follows:

- The technology for information systems exhibits continuous and very rapid evolution.
- There are an increasing number of commercial off-the-shelf (COTS) components available.
- Users’ requirements for an information system evolve as users gain experience with early capabilities.
- Most IT systems or services are components of a larger “system of systems.” (Gilligan et al., 2009)

The traditional DoD’s Acquisition System is setup to support larger procurements or platforms such as weapons systems, ships, and aircraft. Due to procurement laws, regulations, and policies, all DoD acquisitions had to follow the framework of the Defense Acquisition System. As previously mentioned, the two most important documents governing acquisition are DoD Directive 5000.01 and DoD Instruction 5000.02 and both are focused more on weapons system acquisition or Major Defense Acquisition Programs (MDAPs) than on information technology. The House Armed Services Committee (HASC) in 2010 stated:

The system remains structured primarily for the acquisition of weapons systems at a time when [IT] services represent a much larger share of the Department's acquisitions. As a result, the Department's formal acquisition policy has limited application to the majority of the Department's acquisitions...Furthermore, while the Department is currently working to modernize in the "Information Age," the acquisition system is particularly poorly designed for the acquisition of information technology. (HASC, 2010)

The traditional acquisition system lacks the flexibility, agility, and responsiveness that are necessary to support the DoD and the warfighter. Thus, one of the primary acquisition problems is the DoD's "one-size-fits-all" acquisition system that has failed to produce the required IT systems on schedule and within budget. According to Gansler and Lucyshyn (2012) in *IT Acquisition: Expediting the Process to Deliver Business Capabilities to the DoD Enterprise*, "nearly half of all major federal IT projects undertaken have experienced delays or changes to requirements that have led to cost and schedule overruns and program restructuring" (Gansler & Lucyshyn 2012). In 2010, the House Armed Services Committee (HASC) Panel on Defense Acquisition Reform reported that the delivery of Defense IT systems required 48 to 60 months to be completed (HASC, 2010). This long period of time is significant based on the fact that the commercial acquisition process has produced newer information technologies much quicker, typically within a fraction of the time it takes the DoD.

Some of the IT acquisition time taken in the traditional acquisition process can be accounted for in such actions as risk assessments and risk reduction. As stated by Timothy Harp (2009), Deputy Assistant Secretary of Defense for Command, Control, and Communications, Intelligence, Surveillance, Reconnaissance and Information Technology Acquisition, in his 2009 testimony to the HASC on Acquisition Reform, "[the] weapons system acquisition process is optimized to manage production risk and doesn't really fit information technology acquisition that does not lead to significant production" (Challenges to Effective Acquisition and Management of Information Technology Systems, 2009). Since the threshold of risk management for the traditional defense acquisition system

requires a higher risk than for the typical “mature technology” or commercial off-the-shelf (COTS) product used to produce Defense business systems, the traditional Defense acquisition process does more harm than good when acquisitioning Defense business systems (Gansler & Lucyshyn, 2012). Moreover, the design of the traditional acquisition system helps to reduce the risk associated with multibillion-dollar investments and complex weapons programs by using repetitive and detailed reporting requirements to provide visibility so that problems can be identified early in the acquisition process. Long durations are understandable for weapons system acquisition processes due to the extensive and detailed process that includes Joint Capabilities Integration and Development System (JCIDS) initiation through full development (HASC, 2010). However, Defense business systems can be developed with less inherent risk so extensive and repetitive documentation used in weapons systems acquisition are problematic and result in more time spent in the acquisition process (Gansler & Lucyshyn 2012).

C. ISSUES EXTENDING FROM LENGTHY ACQUISITION TIMELINES

Commercial IT acquisition processes utilize industry standards and best practices and essentially exercise a more efficient process to develop newer technologies in a timely manner. In fact, the commercial sector is able to deliver IT capabilities and incrementally improve on those initial deliveries in 12 to 18 months (HASC, 2010). With Defense IT systems typically taking 48 to 60 months to be delivered, DoD system are not as timely despite two major influences that encourage more timeliness. The first influence is the pace of technology change, which puts pressure on acquisition timelines in order to ensure relevancy once the system is delivered (DSB, 2009). Given the nature of the Information Age, IT acquisition programs are greatly affected by the rapid pace of change in technologies. As mentioned previously, Moore’s Law predicts that hardware capability per unit expenditure doubles roughly every 18 months. In a commercial market environment dominated by Moore’s Law and a high rate of technological change, hardware obsolescence and supportability has become

a significant issue that has affected DoD IT acquisition programs. Software, on the other hand, is driven by an even-faster pace of technology change due to the Internet environment and end-user expectations (Gansler & Lucyshyn, 2012). Since DoD IT acquisition programs progress at a much slower rate, the DoD is unable to keep pace with the rapid rate of IT innovation in the commercial sector, and fails to fully capitalize on IT-based opportunities (NRC, 2010).

The second major influence on IT acquisition timescales are military missions and operational tempo because military operations are requiring increasingly more rapid-response times (DSB, 2009). Moreover, decision cycles in conventional warfare have shortened from days to hours and in some cases even seconds. As reported by the DSB in 2009, “the overall portfolio of DoD IT programs has experienced a 21-month delay in delivering initial operational capability to the warfighter, and 12 percent are more than four years late” (DSB, 2009). Worse yet, once the delayed product is received, the end user often finds that the requirements, technology, and standards have changed or the technology is already two or three generations behind (Gansler & Lucyshyn, 2012).

The DoD has relied on an acquisition process that involved many non-integrated parts and error-prone processes that were redundant and did not provide the visibility necessary to make sound IT acquisition management decisions. Of the multiple failings of the Defense acquisition system, one major point of failure has occurred at milestone decision points. Milestone decisions will be covered in Chapter III, but for now it is only important to know that milestones are critical junctures in every acquisition program where a program must gain approval from many different functional organizations. For IT, the acquisition process tended to stall at milestone decision points because when a system reached certain milestones, it could take up to 90 days for a milestone decision to be reached (DSB, 2009). These stoppages or delays could easily increase the schedule. In addition to the milestone decisions delays, excessive program documentation requirements brought on by the traditional acquisition system

create additional delays and shifts in scheduling, which further distance the existing process from commercial best practices (Gansler & Lucyshyn, 2012).

D. TESTING AND EVALUATION ISSUES

Testing and evaluation (T&E), as it relates to IT, is an issue in the traditional Defense Acquisition System. Although DoDD 5000.01 states that test and evaluation shall be integrated throughout the Defense acquisition process, testing is often integrated too late in IT systems acquisition practices (USD[AT&L], 2007). Testing is reserved until the end of the developmental cycle or administered during the mandated operational testing phase in a realistic environment (HASC, 2010). Because testing does not occur throughout the development cycle, it can be detrimental to the effective progress of Defense business systems acquisition as well as to the integration and interoperability objectives sought in most IT projects. Defense business systems are highly dependent on user feedback, which can be integrated into the product in the form of new features or more intuitive design (Gansler & Lucyshyn, 2012). Failing to conduct continuous testing can lead to more developmental time due to intensive redesign once issues are discovered following large blocks of untested development. Essentially, IT systems that lack continuous testing and evaluation cause not only delays but also cost overruns while limiting the potential effectiveness of the product (Gansler & Lucyshyn, 2012). Also, unnecessary testing can waste time and cause delays. According to Teresa Takai, DoD Chief Information Officer (CIO), in her remarks during a 2011 congressional hearing on improving the management and acquisition of IT systems in the DoD, “we will need to look at our testing and accreditation processes, because that is one of the inhibitors that we are aware of today in terms of retesting platforms for every upgrade as opposed to recognizing that there are standard platforms and there is not the need to test” (Improving Management and Acquisition of Information Technology Systems in the Department of Defense, 2011). Takai’s comment is in regard to the use of commercial systems that include commercial off-the-shelf

(COTS) products that have already been tested and approved but essentially go through a retesting process.

In regard to COTS technologies, they are not only inefficiently tested but they are also insufficiently leveraged, excessively tailored, and excessively delayed, according to the National Research Council (NRC, 2010). In fact, many programs have experienced acquisition lead times that have significantly exceeded the lifecycles of the underlying COTS technology by years. This happens due to unnecessary testing but also to oversight processes that focus too much on potential shortcomings of COTS products and services (NRC, 2010). As a result, this approach to COTS products inhibits the timely delivery of meaningful end-user capabilities. Ultimately, the processes used for the acquisition and testing of IT systems can last more than 5 years before a solution is delivered to the end users (NRC, 2010). Once again, given the rapid pace of change in the IT world, solutions eventually delivered within this time frame are often found to be inadequate by end users.

E. LEGISLATIVE IMPEDIMENT AND OVERSIGHT ISSUES

The purpose of acquisition oversight in the DoD is for the disciplined management of large, expensive, and complex systems (NRC, 2010). Throughout the government, oversight processes are exercised by multiple oversight constituencies. Oversight for a government IT program can consist of acquisition officials, CIOs, DoD officials, and even Congress that authorizes and appropriates funds and enact laws governing procurement. Each one of these entities can make different demands (e.g., program documentation, reports, and briefings) as they exercise their oversight roles. With multiple oversight bodies taking part in the program oversight and review process, the acquisition system gives undue leverage to entities that often are not true stakeholders (e.g., end users) in the process (NRC, 2010). This, imbalance, of course, can have negative effects on the program. For instance, too many detailed requirements can be included in the program, which may result in the inability to prioritize these

requirements effectively. Also, these different requirements could be contradictory or extremely difficult to implement. Too much oversight or governance can be a barrier in the acquisition of IT. For example, in 2009 the Defense Acquisition Performance Assessment Panel stated, “current governance structure does not promote program success—actually, programs advance in spite of the oversight process rather than because of it” (DSB, 2009). Although oversight is intended to be a good thing, some oversight entities are so burdensome that they actually slow programs down and even increase the probability of failure (Gilligan et al., 2009).

As mentioned, Congress serves in an oversight role and is very much involved in addressing the issues of IT acquisition. In fact, the Defense Science Board report stated “Congress has lost confidence in DoD’s execution of IT programs, which has resulted in increasing program scrutiny and budget actions (generally funding cuts) for programs that are faltering” (DSB, 2009). Furthermore, this loss of confidence has resulted in more congressional involvement. While acting in their oversight role, Congress has responded to IT acquisition issues by adding more restrictive legislative mandates. For example, the 2007 National Defense Authorization Act contained unprecedented mandates involving the acquisition of IT. These mandates defined the criteria for Major Automated Information Systems (MAIS) programs and required annual reports to Congress containing the following: development schedule with major milestones; implementation schedule including, estimates of milestone dates, initial operational capability (IOC) and full operational capability; estimates of development and lifecycle costs; and a summary of key performance parameters (DSB, 2009). These responses to acquisition problems have not only created more oversight and governance, but some of these changes were excessively process-centric and even adversarial (NRC, 2010). Even though congressional involvement is mandated and actually necessary at times (e.g., authorizing funding), over involvement has served to lengthen the IT acquisition process,

especially since these mandates create a focus on review documents and other process artifacts. These mandates are well-intended changes, but they have made the timely delivery of IT capabilities even more difficult. Lastly, excessive involvement by Congress could become even more problematic if ever DoD begins executing programs well (DSB, 2009). This point is not to undermine congressional authority, which is clearly outlined in the Constitution; however, the point is simply to highlight the fact that some congressional processes can become convoluted, confusing, and inefficient for the DoD acquisition process.

Another oversight issue involves cost threshold and governance. The DoD acquisition framework prescribes elaborate governance or oversight mechanisms and cost thresholds that trigger varying levels of review (NRC, 2010). As shown in Figure 3, IT programs are assigned acquisition categories that correspond to the estimated acquisition cost and are then aligned to the oversight level based on these associated cost thresholds (i.e., assignment to a DoD-level agency, Service, or program executive officers). The problem lies in the total dollar thresholds for designating oversight levels for IT programs because these dollar thresholds are significantly lower than those used for weapons systems programs (NRC, 2010). The result creates a contrast in which an IT system that is an ACAT IA with a development and deployment cost of \$126 million over its lifecycle has highly centralized oversight at the DoD-level, while a weapons system counterpart at the same dollar amount can be decentralized for oversight at the program executive officer level (NRC, 2010). Again, this excessive oversight creates more layers to traverse, which will assume more transaction and decision time. To further exacerbate this issue, as seen in Figure 3, there is no provision for major automated information system (MAIS) programs to even receive oversight at the Service or agency level (NRC, 2010).

F. ISSUES WITH REQUIREMENTS DETERMINATION AND FUNDING

Requirements determination is the single most important part of the acquisition process. Requirements define end user needs and expectations but, also, requirements set in motion the intentions and actions of the acquisition program. Requirements can be described in two ways: top-level requirements (big-R) and detailed requirements (small-r). The difference between the two relate to the amount of information that is required. Big-R requirements convey a widely recognized purpose, mission, and expected outcome (NRC, 2010). For example, a logistics IT system would be assessed on the basis of its ability to process a certain number of logistics requests under certain conditions. However, small-r requirements involve a set of more detailed requirements associated with specific user interfaces and utilities such as the ability to prioritize logistics requests based on time or unit (NRC, 2010). Both types of requirements are equally important and both can be a source of problems in the acquisition process.

Issues involving requirements have served to lengthen the IT acquisition cycle. As described previously, too many detailed requirements levied on IT programs by multiple groups can be problematic. But many times, IT program requirements are initially written with overly detailed specifications (HASC, 2010). At times, these specifications are inconsistent with the pace of technological change and need for rapid delivery of capabilities to the end user (HASC, 2010). Also, the requirements documents have often been inaccurate descriptions of end user needs. The consequence is seen when funding is obtained and the acquisition process is initiated because any newly discovered requirement or need may not be covered by the budget. The House Armed Services Committee in 2010 found that the “existing requirements process is ill-suited for the rapidly evolving nature of the IT marketplace which requires an iterative dialogue on requirements” (HASC, 2010). Moreover, the current process is inflexible and prone to over-specification of requirements. As has been the theme throughout this study thus far, DoD acquisition, budgeting, and requirements processes are

once again designed for large weapons systems acquisition programs, and the process of requirements generation is being inappropriately applied to relatively low-dollar IT acquisition programs (NRC, 2010).

Another issue that is closely related to requirements involves the funding process for IT solutions, which normally takes years and does not support a timely acquisition process. The source of this funding issue is the DoD's Planning, Programming, Budgeting, and Execution (PPBE) system. The entire DoD budget is built using the PPBE system. The problem is that this system operates on a timeline that does not align well with the fast-paced IT commercial marketplace (DoD, 2010). The PPBE offers no flexibility or concessions for IT to be able to respond to the rapid changes of the IT environment. For example, once a capability shortfall or requirement is acknowledged and generated, it is then linked to a funding request to Congress. The request, however, will not be provided for immediately but, instead, funding will be provided in a future year. An issue then arises when solutions that will rely on IT have to wait for the funding process. For instance, the time frame for requesting funding can be many times longer than the actual time needed to develop the solution (NRC, 2010). Essentially, the funding allocation process is not responsive enough to address capability shortfalls and requirements as they relate to IT solutions. Not only does funding take years to process, but also another complicating factor is that IT programs are funded individually. These individual funding processes involve three principal types of appropriation: research and development, procurement, and operations and maintenance. Also, each of these types of appropriations has unique rules and definitions that align funding to a particular program. The funding problem then becomes exacerbated when it takes years to process and then the funding is not flexible to permit moving it around to support new requirements discovered during IT development.

G. ACQUISITION WORKFORCE CONCERNS AND MANAGEMENT ISSUES

The Acquisition Workforce includes many career fields such as auditor, contracting officer, program management, test and evaluation, and also information technology acquisition personnel. The DoD Acquisition Workforce is charged with procuring systems and services to meet warfighters' requirements in a timely manner to satisfy national security objectives (NRC, 2010). This workforce requires highly trained specialists, especially in the areas of science, engineering, testing, business, and program management. These highly trained specialists serve as acquisition executives, program managers, and contracting officers responsible for the entire acquisition process. In recent years, a number of studies have expressed concern about the technical proficiency of the IT acquisition workforce and its future status because relatively few in the acquisition workforce have specific expertise in information technology (NRC, 2010).

In the Defense Science Board 2009 report, a review was conducted of major IT acquisition programs (MAIS) where cost, schedule, and performance were issues. These issues developed from three root causes: 1) senior leaders lacked experience and understanding, 2) program executive officers and program managers had inadequate experience; and 3) the acquisition process was bureaucratic and cumbersome, where many who are not accountable must say "yes" before authority to proceed is granted (DSB, 2009). Chief among these problems was the lack of experience. IT acquisition experience, along with qualifications, is critical for the DoD, Service leaders, program executive officers, and program managers to make the right decisions within an IT acquisition program (DSB, 2009).

Developing, implementing, and managing the acquisition process of IT systems require specific and extensive technical knowledge along with leadership capabilities. This requirement is needed at the DoD level, the Services, and within the larger acquisition community as a whole in order to

support acquisition oversight and decision making that occurs at different milestones (DSB, 2009). However, this subject matter expertise is often missing in government managers, acquisition personnel, and others who are responsible for program execution. Not only is IT expertise missing within the DoD, but also the competition for talent is increasing, especially within the commercial sector. Also, both government and the commercial sector have experienced staffing difficulties due to the expected retirement of many in the IT workforce, the small number of remaining personnel, and the dismal outlook of incoming personnel to fill the ranks (DSB, 2009). The deficiency in requisite knowledge and expertise in IT acquisition speaks to a larger problem within the United States regarding trained IT professionals. According to the Defense Science Board (2009), the long-term supply of U.S. engineering and science students is worrisome and arguably a national security concern because over the past 10 years undergraduate engineering degrees in the United States have remained flat whereas South Korea's have risen significantly and China's have grown exponentially (DSB, 2009).

After years of reducing the acquisition workforce in the 1990s, the DoD has greatly increased its number of acquisition personnel but they possess limited IT acquisition experience (Fryer-Biggs, 2012). According to Frank Kendall (2012), USD(AT&L), acquisition personnel need experience and that takes time. Kendall also stated:

My view is that, at the end of the day, the professionalism and the capability of the workforce and how it's supported, more than anything else, affects acquisition outcomes...We grow our own people. We grow our program managers. We grow our chief engineers. We grow our logistic specialists, our private support people. We grow our contracting people. And if we have a shortfall on that, then we have a very long recovery time to correct it. (Fryer-Biggs, 2012)

The DoD has the means to develop its own trained professionals but even that opportunity is limited. The Defense Acquisition University (DAU) is the premier source of acquisition training for the DoD. This training emphasizes

systems program management and policy compliance among other things. However, the acquisition curriculum provided by DAU through the years had not adequately addressed the special challenges of IT system acquisition. Essentially, DAU did not have a comprehensive program involving IT program management and IT testing and evaluation, or training courses designed to enhance technical skills (NRC, 2010). Due to this shortfall, DAU was not able to prepare program executive officers or program managers to run IT programs effectively.

On-the-job training can take place as well, but this training is not always productive. Program managers that typically manage weapons systems programs could assume a PM role for an IT program; however, even if that program manager proved to be highly successful at managing weapons systems acquisitions, he or she may not be adequately prepared to take on IT systems management given the nature of IT technicality and specification (DSB, 2009). Ultimately, the DoD does not require program managers to have IT-specific knowledge or experience to manage IT programs and this inexperience can be detrimental to the program even as they receive on-the-job training.

Other workforce issues as described by the National Research Council are as follows:

- The DoD rotates personnel too often for any one PM to see an acquisition through more than a single milestone
- The acquisition process rewards the following of acquisition processes rather than the delivery of useful and usable capability to end users
- The military culture is a “can do” culture—no program manager wants to say that a given task cannot be done

- Program size is used as a success metric and is associated, overtly, with rank. As a result, program managers are incentivized to make programs larger, which contrasts starkly with evidence from many studies that smaller programs reduce cost and risk (NRC, 2010).

Of these issues, the DoD's rotation of acquisition personnel is especially problematic along with military personnel who are rotated before an acquisition process has matured. Military personnel are extremely important to the acquisition process but do not seem to possess as much responsibility as the civilians who make-up the majority of the IT acquisition workforce. None of the literature reviewed here specifically discusses what the military's role is or ought to be in addressing the IT acquisition problem. Since this problem affects military capabilities and operations, it appears that uniformed personnel should have a larger and even more significant role in the IT acquisition process. The military role as it stands, at least for military-specific systems, normally relates to defining end user requirements and some oversight responsibilities (i.e., Program Executive Officer or Program Managers). In regard to end-user requirements, the requirements generation portion of acquisitions has already been identified as a problem area within the IT acquisition process. Military personnel, as well as civilian acquisition personnel, limited tenure in an IT acquisition program can create discontinuity and experience gaps, and can hinder program progress. This workforce or personnel issue speaks to the overall management issues that have plagued the acquisition system. These management and programmatic issues begin at the very top level of the DoD with issues of roles and responsibilities.

In past years, and perhaps even still, DoD agencies have had issues with roles and responsibilities regarding the management of the IT acquisition system (DSB, 2009). These issues may occur because acquisition authority in the DoD is spread across several different organizations, which can result in a lack of coordination or synchronization. Although the Under Secretary of Defense for Acquisition, Technology, and Logistics USD(AT&L) appears to have the most

control over IT acquisition, the Secretary of Defense has many other offices that contribute to the decision-making process and acquisition of information technology, and these offices serve separate functions and provide different services within the DoD. These various DoD offices are depicted in Figure 4 and include the Chief Information Officer (CIO), the Comptroller/Chief Financial Officer, Operational Test and Evaluation (OT&E), and Deputy Chief Management Officer. In 2009, Congress believed that IT acquisition problems were beyond the scope of just the USD(AT&L) and that they were a problem of the scope of the Secretary of Defense (SECDEF) because many of the agencies that perform a function in the acquisition process do not report to the USD(AT&L) (HASC, 2009). Often, these offices are not aligned and according to Congress, it is unclear if these organizations are serving with common focus toward achieving improvements in the IT acquisition process (DSB, 2009).

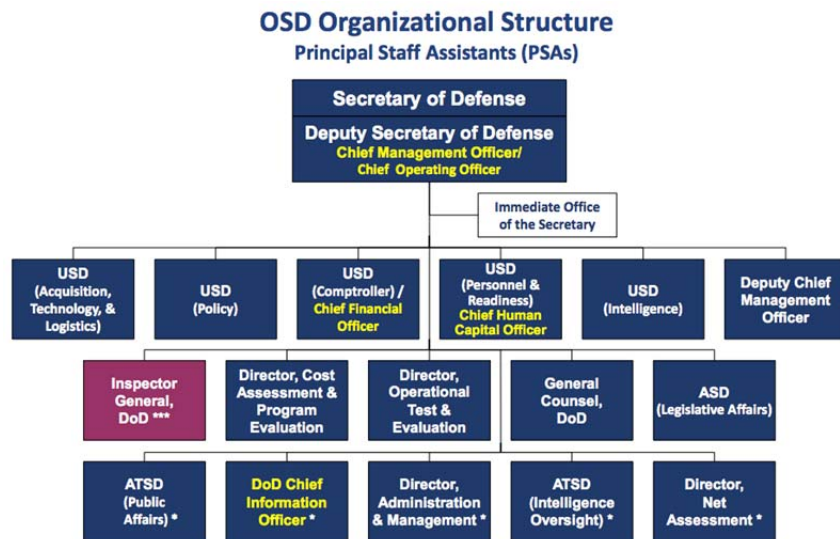


Figure 4. DoD Organization Chart (From “OSD Organizational Structure,” 2013, May 24)

The IT acquisition system is seen as a problem not just within the DoD, but also across the entire federal government because the same acquisition policy is applied throughout government. A 2008 GAO report found that nearly half of all major federal government IT projects were re-baselined, with half of those being re-baselined more than once, which, of course, adds more time to the acquisition process (GAO, 2008).

Despite these significant acquisition problems, IT has been a great benefit to the Department and its military services and has changed business operations and the way warfare is conducted. However, the DoD has a ways to go in keeping pace with the Information Age as evident in all the problems that have been reviewed. All of the problems described throughout the literature contribute to the overall problem within the IT acquisition system—the failure to acquire IT systems in a timely manner. The problems are imbedded in many of the major processes used to acquire new technology. An extensive look at the traditional acquisition system and its processes will be described in Chapter III. This singular process has hampered IT acquisition with acquisition-related practices that favor large programs, high-level oversight, and a very deliberate, serial approach to development (NRC, 2010). Thus, the DoD recently began an IT acquisition reform effort and is currently fielding a new IT acquisition framework to address many of the problems discussed. Chapters III and IV will examine this new acquisition framework and its ability to provide the solutions to the IT acquisition problems described in this chapter.

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III. REFORM EFFORTS AND THE CURRENT IT ACQUISITION SYSTEMS

The problems identified in Chapter II have persisted for many years. For this reason, there have been many reform efforts initiated in order to address the various problems that have affected the overall acquisition system, not just IT acquisition. It is important to understand previous reform efforts because they provide a context with which to assess this newest reform effort and the probability that it will solve the problems identified. This chapter will begin with a brief history of the significant reform efforts that have taken place over the past 30 years within the DoD acquisition system and how each reform effort has impacted the acquisition process, which has led to the current acquisition system. Then, this chapter will take an extensive look at the current acquisition system, which now consists of two separate strategies or frameworks: the traditional Defense Acquisition System framework and the new Business Capability Lifecycle (BCL) framework, which is exclusively designed for Defense business systems and major automated information systems (MAIS).

A. ACQUISITION REFORM HISTORY: EARLY 1980s TO PRESENT

The acquisition system has been problematic for a long time and the need to reform it has been widely acknowledged. Since the early 1980s, numerous studies have informed the DoD of the shortcomings of the acquisition system. Many of these studies have initiated changes to policy and process. Acquisition reform initiatives have occurred more often since the 1980s in large part due to information technology advancements in the commercial sector.

In the early 1980s, acquisition reform was ushered in due to fraud, waste, and abuse issues found within the acquisition system (Allen & Eide, 2012). In response to these issues, a commission on Defense Management, referred to as the Blue Ribbon Commission, was instituted along with new legislation that included the Goldwater-Nichols DoD Reorganization Act of 1986 (Allen & Eide,

2012). The Blue Ribbon Commission reported that excellence in Defense management will not emerge simply by legislation or directive alone, but that the acquisition workforce must be empowered to succeed, and that DoD, the industrial base, and Congress must all set aside parochialism to restore a sense of shared purpose and mutual confidence (Allen & Eide, 2012). Furthermore, the commission recommended ways to improve program stability in order to mirror successful industry practices. Some of these recommendations were codified into law. In regard to DoD, the Blue Ribbon Commission found that diluted authority of execution existed within the Department, so a major restructuring ensued as a result of the Goldwater-Nichols Act (Allen & Eide, 2012). As a result, the National Defense Authorization Act for fiscal year 1987 directed that all acquisition functions be consolidated within the offices of the Service secretaries and that a newly created position of the Under Secretary of Defense for Acquisition be installed (Allen & Eide, 2012).

During the 1990s, the Blue Ribbon Commission recommendations saw further reform introduced that impacted how the DoD viewed its workforce, how it conducted commercial practices, and how it did business. There existed a need to improve the quality of the acquisition workforce, even back then, so the Defense Acquisition Workforce Improvement Act (DAWIA) of 1990 was created. DAWIA established standards for education along with a specific career path for the acquisition workforce. One of the most significant reforms was initiated in 1994 by then Secretary of Defense William Perry who directed the military departments to abandon military specifications and standards when contracting for goods and services (Allen & Eide, 2012). Instead, Perry mandated that the military departments use commercial specifications and standards. Also, Perry mandated the use of the Integrated Product and Process Development (IPPD) and Integrated Product Teams (IPTs) to manage program execution and that cost as an independent variable (CAIV) would be used to control cost growth (Allen & Eide, 2012).

Also in the 1990s, three other reform efforts took place: the Federal Acquisition Streamlining Act of 1994, the 1996 change to the Brooks Act of 1965, and the Clinger Cohen Act of 1996. The Federal Streamlining Act exempted procurement of commercial items from existing laws, which made them more prone to being used (Allen and Eide, 2012). To broaden its applicability, the Federal Streamlining Act also expanded the definition of “commercial product” to include many other items. In 1996, there was a significant change to the 1965 Brooks Act regarding information technology. Until the mid-1990s, there was a separate set of processes and policies for acquisition of DoD IT systems, as called for in the Brooks Act of 1965 (NRC, 2010). In 1996, the IT and non-IT policies were merged because the requirements of the Brooks Act and other associated processes made the acquisition process too cumbersome and slow (NRC, 2010). Therefore, IT programs fell under a single acquisition process that was specified in the DoD 5000 series regulations. This reform effort was intended to provide a more flexible and nimble framework for all types of programs; however, not long after the IT programs were consolidated under DoD 5000, there developed a need to tailor the process to better suit the needs of IT programs. Since then, there has continued to be a need to tailor the process. Also, there have been repeated efforts to reform the process defined by the DoD 5000 series in order to address persistent challenges in the IT acquisition system, which continue even today. Another significant event in the 1990s was the Clinger Cohen Act (CCA) of 1996, which was a landmark reform effort in regard to information technology. The CCA began as two separate initiatives, the Information Technology Management Reform Act (ITMRA) and the Federal Acquisition Reform Act (FARA). These two reform acts were eventually combined and were subsequently designated the Clinger Cohen Act after being signed into law as part of the National Defense Authorization Act for Fiscal Year 1996 (CCA, 2006). The CCA also established the position of Chief Information Officers (CIO) in government agencies along with their roles and responsibilities (CCA, 2006). Furthermore, the CCA directed federal agencies to focus on the

results achieved through IT investments and a continuation of the streamlining of the federal IT acquisition process (Allen & Eide, 2012). The CCA also eliminated cost accounting standards that had discouraged the commercial industry from doing business with the government (Allen & Eide, 2012). Ultimately, the Federal Streamlining Act and the Clinger Cohen Act created a reduction in government red tape and allowed more commercial innovation, both of which were viewed as key enablers to improving acquisition outcomes. The 1990s would see one final reform in 1997 when then Secretary of Defense William Cohen instituted additional acquisition reforms under what was referred to as the Defense Reform Initiative (DRI). This initiative identified four pillars of reform: 1) a re-engineering to adopt commercial business practices, 2) a consolidation to streamline organizations to eliminate redundancy and maximize synergy, 3) more competition in the market to improve quality and reduce costs, and 4) elimination of excess support structures to free resources and focus on core competencies (Allen & Eide, 2012). Essentially, the 1990s offered a more business-minded approach to addressing acquisition issues and this approach carried over into the next century.

The turn of the century came with revolutions in military affairs, as mentioned in Chapter II with concepts such as net-centric operations, which prompted further revolutions in the way the DoD conducted business. One of the central figures in ushering in these reforms at the turn of the century was then Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]) Jacques Gansler, who continues to influence the acquisition community today. In response to studies directed by Congress in the early 2000s, Gansler sought a new direction through acquisition reform that included three goals: 1) reduce developmental cycle times for new weapons systems; 2) reduce total costs; 3) and right-size the Defense Acquisition Workforce and infrastructure in the new business environment in order to realize savings through efficiencies and maximizing flexibility (Gansler, 2000). These efforts included training of the acquisition workforce on commercial practices, a focus on

cost and schedule over performance, and an increased reliance on an integrated civil-military industrial base (Allen & Eide, 2012). These efforts did not have an IT emphasis although they related to IT as well. Also during this time, then Secretary of Defense Donald Rumsfeld, with his own business-minded approach to transformation, thought buying the right thing was just as important as buying it right (Allen & Eide, 2012). Furthermore, Rumsfeld believed that network-centric capabilities were more important to future conflict than the traditional and ever-present legacy systems, which needed to be replaced (Adler, 2007). Riding the wave of the new Information Age, Rumsfeld worked to ensure that the DoD sought innovation from nontraditional defense industries that embraced technology capabilities.

Leading up to the turn of the century, the acquisition strategy most often employed was the “waterfall” method for IT development. In the waterfall model, well-defined increments of information technology were designed, developed, and fielded in a pre-specified order in a waterfall or cascading process (NRC, 2010). The waterfall model involved a specific and inflexible process that required documented specifications and a request for bids, followed by contracting, delivery, installation, and maintenance. Additionally, the waterfall method was document-intensive in order to satisfy the management goal of successfully meeting program objectives. One of the main disadvantages of the waterfall process was that it emphasized the acquisition process rather than the capability being acquired (NRC, 2010). The increments were sequential and any deviations called for a new baseline, which generally triggered a complete program review. These reviews were problematic because approvals at each step up the acquisition approval chain often became more difficult to obtain (DSB, 2009). The result was usually an increase in the time required to deliver an increment and the overall program (DSB, 2009).

The waterfall acquisition model delivered acceptable results when developing and delivering technologies or requirements over a relatively long time frame; however, when that time frame needs to be shorter, such as is the

case for IT, the deliberate and sequential process of the waterfall model did not work well. As mentioned, IT resides in a domain where change occurs very often and in shorter time frames and the potential ability of adversaries to employ these new technologies quicker than the DoD is even more concerning. Reform was inevitable as the GAO concluded in its 2008 assessment. GAO recommended a fundamental change in the acquisition environment due to systemic problems not only with the process, which was viewed as not being agile enough to support current operations, but also in the requirements generation process (DSB, 2009). Others involved in the acquisition process, including Congress, made similar conclusions that the waterfall process was too document-intensive, time-consuming and process-oriented to be able to effectively respond to end-user requirements (HASC, 2010). Ultimately, this acquisition method was deemed inappropriate and a change was afoot via more reform. The DoD would eventually shift to an evolutionary acquisition method, which replaced the waterfall method, as described in DoDI 5000.02:

Evolutionary acquisition is the preferred DoD strategy for rapid acquisition of mature technology for the user. An evolutionary approach delivers capability in increments, recognizing, up front, the need for future capability improvements. The objective is to balance needs and available capability with resources, and to put capability into the hands of the user quickly. The success of the strategy depends on phased definition of capability needs and system requirements, and the maturation of technologies that lead to disciplined development and production of systems that provide increasing capability over time. (USD[AT&L], 2008)

Although the evolutionary approach is more conducive to IT acquisition, the approach did not solve all the problems and neither did DoDI 5000.02 because it still focused mainly on the procurement of weapons systems.

Despite all the extensive acquisition reform efforts that began in the 1980s, the DoD and Congress began to lose confidence in the acquisition system by 2005 and felt that the system was broken (Report by the Assessment Panel of the Defense Acquisition Performance Assessment Project, 2006). Upon this conclusion, the Defense Acquisition Performance Assessment (DAPA)

Project was established and in 2006 it conducted an integrated assessment of the entire acquisition process. One of DAPA's major findings, like previous efforts, identified excessive oversight and complex acquisition processes as cost and schedule drivers (Allen & Eide, 2012). Also, DAPA cited that stability of requirements is essential for the acquisition system to be effective. In 2009, the Defense Science Board (DSB) took one of the first comprehensive looks at the DoD's acquisition process as it relates to IT systems and found that it was simply too long and ineffective, and did not accommodate the rapid evolution of information technology (DSB, 2009). Furthermore, oversight ambiguity along with management issues were viewed as significant problems that needed to be addressed. Thus, the DSB recommended the development of a new acquisition and requirements development process for IT systems that would be agile and incremental, and allow requirements to be prioritized based on need and technical readiness (DSB, 2009). These DSB recommendations were eventually approved and implemented into policy. According to Gansler and Lucyshyn (2012), this act was certainly a step in the right direction because congressional oversight occasionally created ambiguities in the DoD's acquisition process (Gansler & Lucyshyn, 2012). Moreover, Gansler and Lucyshyn stated:

The Goldwater-Nichols Act, the Clinger Cohen Act, and the 2005, 2007, and 2009 NDAs lacked clarity with regard to specific features of their implementation. Rather than promoting innovation and flexible responses to acquisition problems, the ambiguities led to the creation of more structure, which, in turn, increased the amount of documentation. Although these congressional acts may have reduced systemic risk, they also prompted cost increases and programmatic delays. (Gansler & Lucyshyn, 2012)

Essentially, Goldwater-Nichols, Clinger Cohen and the federal laws that ensued continued to complicate the IT acquisition process and caused overlapping responsibilities between the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]), the Department's CIO, and the Deputy Chief Management Officer.

The Obama administration initiated the most recent acquisition reform initiatives; however, some of which did not go far enough in terms of IT. For instance, the December 2008 revisions to DoD Instruction 5000.02 offered improvements to the process but did not address the fundamental challenges of acquiring information technology for its range of uses in the DoD. In 2009, former Secretary of Defense Robert Gates instituted his own vision of needed acquisition reform that was much like Rumsfeld's affirmation that buying the right thing was as important as buying it right when he stated that "we must reform how and what we buy...meaning a fundamental overhaul of our approach to procurement acquisition and contracting" (Gates, 2009). Furthermore, Gates emphasized that significant change would be necessary to maintaining military superiority in an environment of ever shrinking economic resources and a reduced Defense budget. Gates identified three fundamental steps to reform: 1) senior leaders must demonstrate commitment and courage to discontinue failing programs and programs that procure more capability than necessary, 2) performance requirements must be scrutinized as necessary in order to avoid cost and schedule overruns, and 3) government program teams should be adequately staffed for proper oversight, cost estimates should be more realistic, and budgets should be protected for program stability (Allen and Eide, 2012).

Finally, Congress passed the 2010 National Defense Authorization Act (NDAA) Section 804 in response to the Defense Science Board's 2009 report concerning IT acquisition issues. Section 804 called for the development and implementation of a new acquisition process for IT systems, in particular Defense business systems (DBSs). The DoD released interim acquisition guidance for DBS that provided program managers with a transitional IT acquisition process until the new IT acquisition process could be developed and released (Bellomo, 2011). The DoD would later release a report entitled *A New Approach for Delivering Information Capabilities in the DoD*, which provided an update on the progress towards development of the new IT acquisition process as well as some initial implementation guidelines. In 2010, then Under Secretary of Defense for

Acquisition, Technology, and Logistics (USD[AT&L]) Mr. Ashton Carter approved the use of the new Business Capability Lifecycle (BCL) process for acquiring DBSs as part of DoD's implementation of the agile IT acquisition process (USD[AT&L], 2013). However, this new IT acquisition system does not come without potential problems and shortfalls as will be explained in Chapter IV.

Gates' reform efforts, which were carried forward by his successor, former Secretary of Defense Leon Panetta and current Secretary Chuck Hagel, are continuing to play out today but beg the question if this latest attempt at acquisition reform will succeed where three decades of efforts have seemingly failed. The long history of acquisition reforms within the federal government and the DoD reflects that much has been done to identify the problems, implement solutions, and execute reform actions; however, most of these reform efforts appear to initiate a return to the conclusion that more reform is needed. There is a reason why many of the problems that have existed for years continue to persist. Furthermore, there is a reason why these change efforts did not work or resolve the problems. The history of reform efforts is an important backdrop to Chapter V topics because that chapter will offer insight into why these and many reforms efforts do not succeed or lead to effective change. For now, it is necessary to turn our attention to the current acquisition process and how it has been affected by these latest reform efforts.

B. THE CURRENT IT ACQUISITION SYSTEMS

1. Types of Major Automated Information Systems Acquisition and Acquisition Models

Before discussing the current IT acquisition systems, it is important to understand the types of Defense business systems (DBSs) and/or major automated information systems (MAIS) acquisition goals the DoD seeks to accomplish. There are four general types of IT acquisitions: 1) application software development and integration, 2) commercial off-the-shelf (COTS) hardware and software integration, 3) integration of COTS and custom-

developed capabilities, and 4) commercially provided IT services (DSB, 2009). Another way of describing these four general types of IT acquisitions, as well as describing categories of DBSs is through the use of the terms DoD-unique systems, modified and integrated COTS, and software as a service (SaaS).

DoD-unique systems, modified and integrated COTS, and software as a service (SaaS) encompass what the DoD seeks to procure in the IT acquisition process. A DoD-unique system is required when existing or modified commercial products cannot meet end-user requirements (Gansler & Lucyshyn, 2012). Thus, the DoD must develop its own unique product in an effort to fulfill end-user requirements. However, there is a downside to DoD-unique products in that a unique system or application generally requires a longer time commitment since the product is not available on the commercial market (Gansler & Lucyshyn, 2012). DoD-unique systems are regarded as the least efficient way to acquire an IT system due to this downside.

Commercial off-the-shelf (COTS) IT products are a worthwhile investment and offer the greatest benefit to the DoD although they cannot meet all the DoD's requirements. COTS products are "as-is" systems and applications that can meet end-user requirements and do not require modification or integration of other components prior to implementation (Gansler & Lucyshyn, 2012). Using "as-is" COTS products allows the DoD to leverage commercial investments and take advantage of their technological innovation. By utilizing COTS products, the DoD significantly reduces research and developmental time, and takes advantage of industry best practices (Gansler & Lucyshyn, 2012). However, when it is essential for a COTS product to be integrated into an existing system, COTS products often require modification. Thus, commercial products that have been modified to meet DoD requirements are referred to as modified COTS products and like as-is COTS products, developmental time is reduced compared to DoD-unique systems. To further meet unique end-user requirements, it is often necessary to integrate both DoD-unique systems and COTS systems into an existing system. The integration of a COTS system as a component differs from

modified COTS because modified COTS are obviously modified while integration involves the use of a COTS system as a component within an integrated system (Gansler & Lucyshyn, 2012).

Finally, software as a service (SaaS) is a software delivery method where the Internet or a cloud computing service provides the functionality or capability required. SaaS is beginning to become popular within the DoD as evident in the DoD's 2011 release of the Cloud Computing Strategy. This strategy emphasizes cloud computing as a method to help agencies provide highly reliable, innovative services quickly, despite resource constraints (Kundra, 2011).

As mentioned, DoD-unique systems, COTS products both modified and integrated, and SaaS are the types of IT acquisitions the Department currently seeks to acquire. In doing so, there are now two distinct processes that are used to acquire Defense business systems and/or major automated information systems (MAIS): the traditional Defense acquisition System and the Business Capability Lifecycle (BCL) model. As discussed in Chapter II, MAIS comprised of a range of IT systems that include command and control systems, communications systems, and Defense business systems (i.e., logistics and financial management systems). These systems are intended to provide the DoD with access to a wide range of information in order to effectively organize, plan, execute, and monitor Defense operations. All MAIS programs must utilize one of two acquisition frameworks. The first framework is the traditional Defense Acquisition System framework, which applies to all DoD IT acquisition programs except business system modernization programs that exceed \$1 million in total costs as indicated in DoD 5000.02 (USD[AT&L], 2008). The second framework, the Business Capability Lifecycle (BCL), is relatively new as it was released in June 2011. This framework applies only to business system modernization programs with total costs exceeding \$1 million (USD[AT&L], 2013).

2. The Traditional Defense Acquisition System Framework

The traditional Defense Acquisition System framework is outlined in DoD's 5000 Series publications, specifically DoDD 5000.01 and DoDI 5000.02. The Defense acquisition management system framework can be described as an overarching process that integrates three interdependent processes: requirements, budgets, and procurements (Gansler & Lucyshyn, 2012). These three interdependent processes work both independently and cooperatively in an effort to meet IT program objectives. All three can be described in the three major decision-support systems discussed in Chapter II: the Joint Capabilities Integration and Development System (JCIDS); the Defense Acquisition System; and the Planning, Programming, Budgeting and Execution (PPBE) process. The product or system requirements are defined by the JCIDS, which also provides acquisition program evaluation criteria. The PPBE process determines the budget and is used to allocate and manage financial resources. The procurement process is essentially the Defense acquisition management system or framework. This framework is the mechanism through which the Department develops products and systems. In theory, each of these three processes is designed to work in a coordinated, efficient, and cost-effective manner to deliver required capabilities to the DoD.

The Defense acquisition management system framework provides the steps that Major Defense Acquisition Programs (MDAPs) must take as they are planned, designed, acquired, deployed, operated, and maintained (GAO, 2013). The framework consists of five program lifecycle phases and five related decision points as depicted in Figure 5. The five decision points include three milestone decisions at milestones A, B, and C, which indicate program progression or stage, and two other decisions that consist of the materiel development decision and the full deployment decision (GAO, 2013). The materiel development decision authorizes officials to conduct analyses to assess the potential solutions that can satisfy the program's requirements, and the full deployment decision authorizes the system to be deployed to all relevant locations after limited fielding

has been complete (GAO, 2013). For programs that are required to use this framework, the milestone decision authority (MDA) will either be the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]); the DoD component head; a component acquisition executive (CAE); or when authorized, a designee (GAO, 2013).

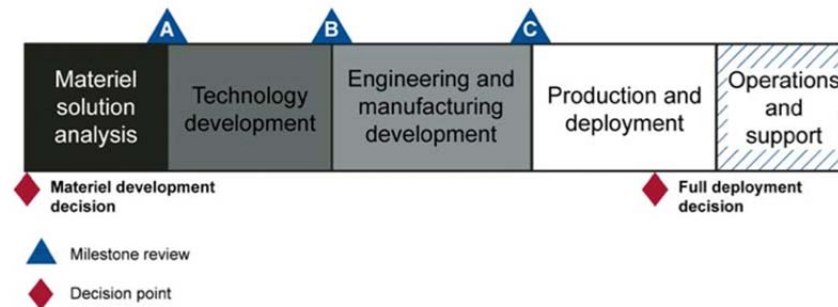


Figure 5. The Traditional Defense Acquisition Management System
(From GAO, 2013)

The Defense Acquisition Framework consists of the following phases as depicted in Figure 5:

- **Materiel Solution Analysis.** The purpose of this phase is to assess the potential materiel solutions for a military need; to refine the initial system solution (concept); and to create a strategy for acquiring the solution. At the end of this phase, the program reaches Milestone A, where a decision is made as to whether or not the program will advance to the next phase.
- **Technology Development.** During this phase, technologies are developed, matured, and tested in conjunction with the simultaneous refinement of user requirements. A decision is made at the end of this phase to authorize product development based on well-defined technology and a reasonable system design plan—referred to as Milestone B. An acquisition program baseline (APB) is first established at the Milestone B decision point. A program's first APB contains the original lifecycle cost estimate, schedule estimate, and performance parameters that were approved for that program by the milestone decision authority. The first APB is established after the program has assessed the viability of various

technologies and refined user requirements to identify the most appropriate technology solution that demonstrates that it can meet users' needs. By the completion of this phase, the program must have mature technology, approved requirements, full funding, an acquisition strategy, and the APB. Additionally, the type of contract that will be used to acquire the system must be specified. The Milestone B decision authorizes entry into the next phase.

- Engineering and Manufacturing Development. The purpose of this phase is to develop and integrate the full system, make preparations for manufacturing, and demonstrate through developer testing that the system can function in its intended environment. A Milestone C decision is made at the end of this phase to authorize entry of the system into the production and deployment phase or into limited deployment or low-rate initial production (LRIP) in support of operational testing.
- Production and Deployment. During this phase, the system is produced, operationally tested, and deployed. At this point, the system achieves an operational capability that satisfies the end-users needs, as verified through independent operational testing and evaluation, and is implemented at all applicable locations.
- Operations and Support. This is the final phase. Program personnel ensure that the system is sustained in the most cost-effective manner over its lifecycle. (GAO, 2013)

The traditional acquisition system framework is designed to translate mission needs or requirements into stable, affordable, and well-managed acquisition programs and has proven relatively successful at producing weapons systems and larger platforms (Gansler & Lucyshyn, 2012). Although this linear acquisition process is based on the development of hardware systems (e.g., weapons and aircraft), it was initially intended to accommodate the needs of all DoD programs to include IT (Gansler & Lucyshyn, 2012). However, the deficiencies of this overall process make this framework ill-suited for the development of IT-centric systems and Defense business systems.

The traditional Defense Acquisition Systems framework has been described as a highly complex mechanism that is fragmented in its operations.

As it relates to IT under this framework, attempts to accelerate IT development cycles in order to keep pace with technical innovation only serve to amplify this fragmentation (Report by the Assessment Panel of the Defense Acquisition Performance Assessment Project, 2006). Not only is the framework fragmented, but also its phases do not conform well with information technology as it relates to commercial industry best practices or COTS products. For instance, the first phase in the acquisition process is Phase A, which is intended to mature technology; however, information technologies in the commercial sector are largely established and already mature so this action is not necessary (HASC, 2010). The next phase, Phase B, is intended to prepare a program for production; however, information technologies are not produced in quantities while being developed (HASC, 2010). The final phase, Phase C, is the production phase, which is irrelevant because information technology, once again, is not produced in quantity (HASC, 2010). To exacerbate these milestone phase issues, the time between the start of a program's analysis phase to Milestone B is on average 43 months or 14 months to complete the analysis of alternatives and 29 months to complete the economic analysis (DSB, 2009). Furthermore, it has taken on average 48 months to deliver useful functionality from the Milestone B decision, which has required 40 months for development with an additional 5–8 months for operational testing and evaluation (DSB, 2009).

With this being the case, IT acquisition programs have suffered considerably. Take, for example, the nine DoD enterprise resource planning (ERP) programs, which are being acquired to replace over 500 legacy systems and will perform business-related tasks (e.g., accounting and supply chain management). According to a 2010 GAO report, “six of the nine [DoD] ERPs have experienced schedule delays ranging from 2 to 12 years and five have incurred cost increases ranging from \$530 million to \$2.4 billion” (GAO, 2010). One of the nine ERP is the Navy ERP, which has experienced a schedule delay of 2 years (GAO, 2010). The GAO produced another report in 2013 as directed by the National Defense Authorization Act (NDAA) for Fiscal Year 2012 which

mandated that GAO select and assess DoD MAIS programs annually through March 2018 (GAO, 2013). The GAO 2013 report stated:

Of the 14 selected Department of Defense (DoD) major automated information system (MAIS) programs, 9 had stayed within their planned cost estimates, while 5 did not (with cost increases ranging from 3 to 578 percent); 5 programs remained on schedule, while 9 experienced delays (ranging from 6 months to 10 years); and 8 programs met their system performance targets, while 5 did not fully meet their targets, and 1 did not have system performance data available. Looking at these areas collectively, 3 programs stayed within their planned cost and schedule estimates and met their system performance targets, and 2 programs experienced shortcomings in all of the areas—cost, schedule, and performance. (GAO, 2013)

The Navy ERP was one of the 14 MAIS programs selected for review, as the Navy ERP remained on GAO's radar as a failing MAIS acquisition program. The failures of the traditional Defense acquisition system while being used to acquire the Navy ERP were significant in delaying its completion.

The Navy ERP is currently being acquired using the traditional Defense Acquisition System framework. The procurement process began in 2003 and it is still in the acquisition process because it is not fully deployed as of yet as depicted in Figure 6. As of November 2012, the Navy ERP had been fully fielded to 108 locations and 72,000 users but the program has been working to stabilize the system in order to achieve full deployment, which is planned for August 2013 (GAO, 2013). Once fully deployed, the Navy ERP is intended to replace segregated legacy systems with a single integrated software system (GAO, 2013). This new system will provide an end-to-end supply chain solution for receiving, processing, and fulfilling requests for resources; will integrate financial management, workforce management, inventory management, and material operations; and will provide a rapid response to logistical needs of operating forces (GAO, 2013).

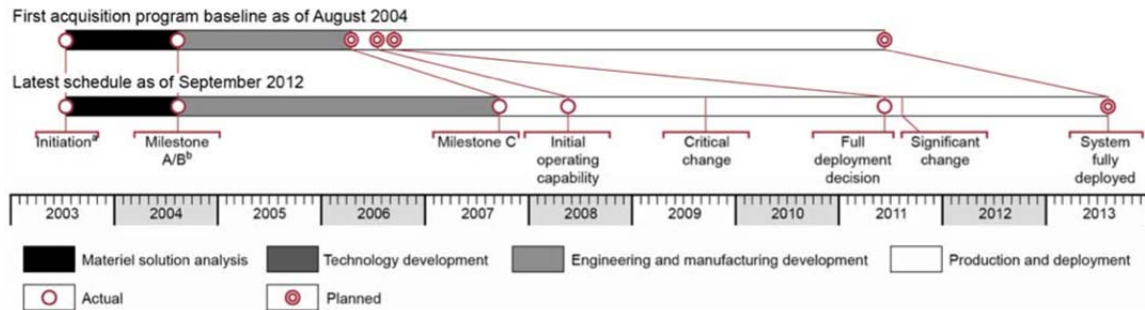


Figure 6. Navy ERP (From GAO, 2013)

As mentioned, the Navy ERP experienced significant schedule slippage that exceeded the planned schedule by more than 2 years. Delays occurred as a result of several issues in the program involving requirements, testing, and system development. In regard to requirements, there was a change in 2009 to remove certain maintenance requirements from the ERP that were perhaps unnecessary. As discussed in Chapter II, when using the traditional Defense acquisition system, the requirements definition phase has been problematic. It appears that the Navy ERP had an issue with “small-r” requirements, which again are the more detailed requirements or information associated with specific user interfaces and utilities. It is not specified why the Navy ERP’s maintenance requirement was removed, but it is clear that issues involving requirements serve to lengthen the IT acquisition cycle. Another issue occurred in 2011 regarding testing, which was also problematic within the traditional framework. For instance, a substantial number of system deficiencies were identified during system development and initial testing of a supply solution, which resulted in the program failing to achieve its planned full deployment decision (GAO, 2013). As discussed in Chapter II, testing has been an issue in the IT acquisition process because it is often integrated too late during system development. Perhaps, if testing were conducted throughout the process, the issue regarding the supply solution would not have caused such a significant delay, if any. Also, final operational testing and evaluation for the Navy ERP was delayed from April 2012 to January 2013 due to the need for additional time to mitigate system deficiencies (GAO, 2013). Once again, system deficiencies could have been

detected and mitigated a lot sooner if the acquisition process were accommodating to testing early and often. Lastly, other program delays were attributed to changes that were implemented based on lessons learned from an earlier deployment.

Schedule slippages and delays in delivering IT systems have been the focus of this study but, as discussed earlier, schedule delays and the long acquisition timelines have adverse effects on both cost and performance. In regard to cost, the schedule slippages significantly affected the Navy ERP's initial lifecycle cost estimate. In fact, program officials attributed the lifecycle cost increases to schedule slippages, an increase in demand for on-site support and stabilization activities during system deployments, and adding requirements to support business process reengineering and improved financial management information (GAO, 2013). In regard to performance, these schedule slippages can be loosely tied to performance as well. For example, the Navy ERP had only partially met its system performance measures because substantial system deficiencies remained. In December 2012, program officials reported that the performance measure that it did not meet may not be related to the Navy ERP system and that root causes would be further identified during the final operational testing and evaluation scheduled to begin in January 2013 (GAO, 2013). Originally, the Navy ERP testing and evaluation phase was scheduled to begin in April 2012, nine months earlier, but due to schedule slippages it did not take place. If the schedule had been maintained to allow testing and evaluation to occur in April 2012, then the performance measure that was not met due to an unknown problem could have been investigated and resolved a lot sooner in order to deliver required performance.

Overall, the 2013 GAO report highlights the significant problems among current MAIS programs and many of these problems are the same old problems that have plagued the entire IT acquisition process over the past decade. There have been a number of assessments conducted by many groups that have determined the inadequacy of this framework as it relates to IT acquisitions.

After the Defense Science Board (DSB) released its 2009 report indicating that “16 percent of all IT projects complete on time and on budget, 31 percent were cancelled before completion, 53 percent were late and over budget, and of those that were completed, the final product contained only 61 percent of the originally specified features 10 years ago,” the National Defense Authorization Act of 2010 mandated the development and implementation of the new Business Capability Lifecycle (BCL) acquisition framework.

3. Business Capability Lifecycle Framework

The DoD’s goal is to acquire IT systems quickly and cost effectively; however, this goal has been rarely achieved due to the deliberate process of the DoD traditional acquisition system. Thus, the Business Capability Lifecycle framework was created via a business process reengineering (BPR) effort that was aimed at making improvements by elevating efficiency and effectiveness of the end-to-end acquisition business process. The Under Secretary of Defense for Acquisition, Technology & Logistics (USD[AT&L]) established the new BCL policy in *Directive-Type Memorandum (DTM) 11-009, Acquisition Policy for Defense Business Systems*, which sets guidance for the implementation of this new framework. Also, the Office of the Deputy Chief Management Officer (ODMCO) is integral to the implementation process, as this office leads integration and improvement efforts for all DoD business operations. The BCL framework was authorized for implementation in June 2011 and was last updated in January 2013. BCL policy only applies to DBS modernization programs that incur a total cost over \$1,000,000 dollars. For programs less than this amount or for programs that are non-DBS, the traditional acquisition system still applies.

In general, the Business Capability Lifecycle (BCL) framework is an “overarching framework for the planning, design, acquisition, deployment, operations, maintenance, and modernization of Defense business systems” (USD[AT&L], 2013). BCL facilitates rapid Defense business systems and major automated information systems acquisition and deployment by providing a

process that is exclusively tailored to the unique requirements of DBS and MAIS programs (USD[AT&L], 2013). BCL takes a holistic approach to IT acquisition that includes doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) in order to conduct a rigorous analysis of the requirements to enable rapid delivery of business capabilities to the warfighter in a compressed time frame (USD[AT&L], 2013). The BCL framework has been set as mandatory guidance in the DTM but will be incorporated into DoD Instruction (DoDI) 5000.02 later this year. Also, the framework is viewed as a guideline and tailoring that is consistent with statutes and sound business practices is encouraged (USD[AT&L], 2013).

The DoD has instituted BCL with the expressed intent to address the unique challenges of IT acquisition, recognizing that the traditional acquisition system is not agile enough to meet the speed at which new IT capabilities are being produced in the commercial sector. BCL recognizes that technology rapidly evolves, and, consequently, BCL mandates rapid capability development. The BCL framework consolidates the requirements, investment, and acquisition processes under a single governance framework and provides an end-to-end process that is intended to be much different from the traditional acquisition system (USD[AT&L], 2013). Furthermore, BCL provides tiered accountability while delegating authority and accountability for program outcomes and compliance down to the lowest appropriate levels, which has been a problem under the traditional system (USD[AT&L], 2013). The BCL model is based on best commercial practices and is more outcome oriented. Ultimately, the BCL framework is designed to address the long-standing problems that have affected the timely delivery of IT business capabilities. Specifically, BCL addresses problems such as programs lacking well-defined, strategically linked requirements; the multiple review and governance bodies that are redundant, delays created by bureaucracy; and JCIDS and DoDI 5000.02 guidance and procedures which are primarily designed for major weapons systems acquisition that have taken more than 5 years on average.

The BCL process seeks to employ an incremental approach to IT acquisition that would begin with an approved business need that requires a materiel solution. Then, the approved materiel solution is divided into discrete, fully funded, and manageable increments in order to facilitate development and implementation of the DBS (USD[AT&L], 2013). Furthermore, these increments are developed, tested and evaluated, produced, deployed, and sustained to be useful and supportable capabilities in an operational environment. Also, there can be multiple releases within a single increment or multiple increments can be approved concurrently if funding, approved requirements, and the appropriate entrance and exit criteria have been met (USD[AT&L], 2013). The emphasis here is that delivery of IT capabilities within a single increment must be based on mature technologies and funding must be in place. Functional capabilities that are not supported by adequate cost estimates, mature technologies, or any other reason will be deferred to subsequent program increments (USD[AT&L], 2013).

The BCL framework consists of seven lifecycle phases and five decision points—milestones A, B, and C, a materiel development decision, and a full deployment decision as depicted in Figure 7. Along with these decision points, there are seven developmental phases in the BCL framework, one of which is a completely new concept and is referred to as the Business Capability Definition, which occurs at the very beginning of a program.

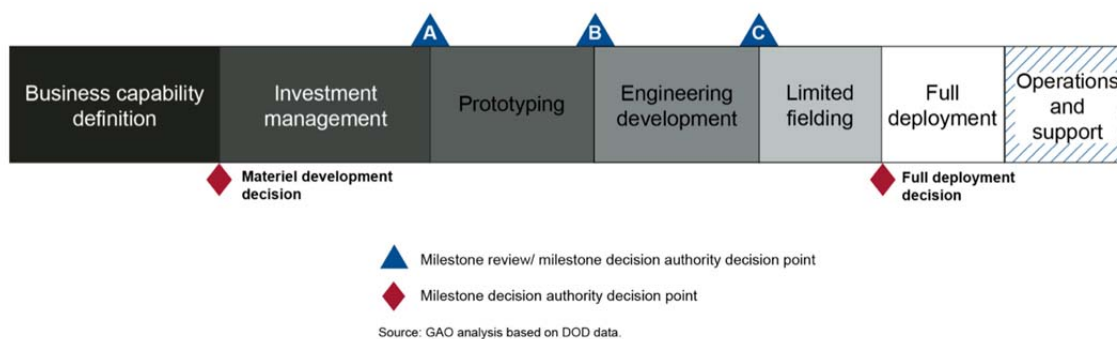


Figure 7. Basic BCL Framework (From GAO, 2013)

Additionally, the BCL framework comprises three distinct stages: Business Capability Definition (BCD), Investment Management (IM), and Execution. The Execution stage consists of the remaining phases (e.g., Prototyping Phase) or the actual acquisition portion of the BCL process. In total, the BCL framework consists of the following processes:

- Business Capability Definition (BCD). The purpose of this phase is to analyze a perceived business problem or need, capability gap, or opportunity and to document the results in a Problem Statement to inform the Investment Review Board (IRB) Chair and MDA decisions. The activities performed and documentation required in the BCD phase shall be used in lieu of the Joint Capabilities Integration and Development System (JCIDS).
- Investment Management (IM). The purpose of this phase is to assess potential materiel solutions and to satisfy the phase-specific entrance criteria designated by the MDA for the next milestone. The entrance criteria for this phase are an approved Problem Statement, Analysis of Alternatives (AoA) Study Guidance, and AoA Study Plan sent to the MDA.
- Prototyping. The purpose of this phase is to demonstrate the capability of the software to meet business process requirements as outlined in the Business Case. Prototyping includes installing IT in a relevant environment to gain the knowledge necessary to refine user requirements and inform APB development. The entrance criteria for this phase are completion and submission of a Business Case reflecting the AoA results and the proposed materiel solution, a CAE-approved Program Charter, full funding for the Prototyping Phase as certified by the responsible IRB and approved by the Defense Business System Management Committee (DBSMC), and compliance with the MS A statutory and regulatory requirements.
- Engineering Development. The purpose of this phase is to demonstrate that the materiel solution for the increment has been designed, configured, developed, and tested in a manner consistent with the approved Business Case and Program Charter, and that the materiel solution is ready for limited fielding and testing in an operational environment. The entrance criteria for this phase are the completion of the specified objectives for the prototyping

phase, if conducted; full funding of the program or program increment; submission of a draft APB and an updated Business Case and Program Charter; and compliance with the MS B statutory and regulatory requirements.

- Limited Fielding Phase. The purpose of this phase is to limit risk by providing the capability to a limited number of users and testing it in an operational environment. Operational test and evaluation (OT&E) shall determine the operational effectiveness and suitability of the system. The entrance criteria for this phase are completion or satisfaction of the objectives of the Engineering Development Phase; the Functional Sponsor or end-user's determination that the capability achieves the outcomes specified in the Business Case; and the program's compliance with the statutory and regulatory requirements.
- Full Deployment Phase. The purpose of this phase is to field an increment of capability for operational use in accordance with the Business Case. The entrance criteria for this phase are completion of Initial Operational Test & Evaluation (IOT&E) or other required testing; declaration of initial operational capability (IOC); and satisfaction of the DOTMLPF solution outlined in the Business Case.
- Operations and Support (O&S). The purpose of this phase is to execute a support program that meets materiel readiness and operational support performance requirements and sustains the system in the most cost-effective manner over its total lifecycle. Planning for this phase shall begin prior to program initiation and shall be summarized in the Business Case. O&S has two major efforts: lifecycle sustainment and disposal. The entrance criteria for this phase are completion and submission of an approved Business Case, satisfaction of any conditions imposed by the MDA at the Full Deployment Decision (FDD), and the Functional Sponsor's written declaration that the system has achieved FD, as defined in the Business Case. (USD[AT&L], 2013)

To meet the demand of rapid development, the BCL is designed to execute programs quicker than has been the case using the traditional acquisition system. For instance, the BCL process is set up to allow no more than 12 months between the Materiel Development Decision (MDD) and MS A,

no more than 12 months between the initial contract and MS B, and no more than 18 months between contract or option award and the Full Deployment Decision (FDD) (GAO, 2013). The final decision will be the FDD, which will be made by the MDA authorizing an increment of the program to deploy for operational use.

For DBS programs that are MAIS using the BCL incremental acquisition approach, all functional capabilities associated with each increment will reflect the Acquisition Program Baseline (APB) or cost, performance, and schedule goals and must be achievable within 5 years from when funds were first obligated (GAO, 2013). For all DBS that are not MAIS, these programs must achieve Initial Operating Capability (IOC) within a 5-year period from Milestone (MS) A (GAO, 2013). Ultimately, the Milestone Decision Authority (MDA) will not grant a MS A decision if IOC cannot be achieved within 5 years; and in no event will a Full Deployment Decisions (FDD) occur later than 5 years from when program funds were first obligated.

The first program to achieve an acquisition decision under the BCL framework was a struggling Air Force financial management program called Defense Enterprise Accounting and Management System (DEAMS) (Information Technology and Cyber Operations, 2013). As depicted in Figure 8, DEAMS was initiated in 2003 and development continues today. Due to issues in the acquisition process, which utilized the traditional acquisition framework, DEAMS transitioned to the BCL framework in February 2012 (GAO, 2013). DEAMS Increment 1 was the first IT developmental process to utilize the BCL framework and the development process is currently underway. Increment 1 was developed to provide 60 percent of the Air Force with the entire spectrum of financial management capabilities and is also intended to be a key component of the DoD's plan for achieving fully auditable financial statements by 2017 as required by the National Defense Authorization Act for fiscal year 2010 (GAO, 2013).

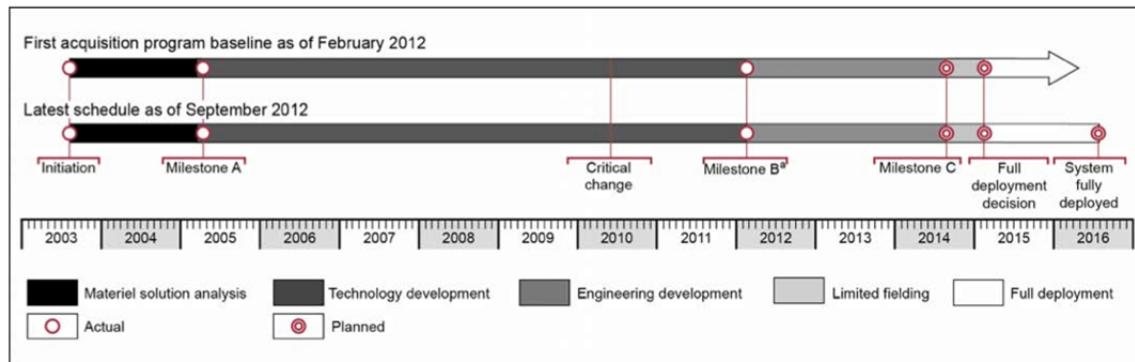


Figure 8. Prior to Milestone B, the program was complying with the traditional acquisition framework. Following Milestone B in February 2012, the program began complying with the BCL model. (From GAO, 2013)

Although the program had been struggling under the traditional acquisition system, in 2007 and 2010, the Air Force began demonstrating some capabilities provided by DEAMS (GAO, 2013). However, due to schedule delays experienced in 2010, the program underwent a critical change. This critical change resulted in a restructuring of the development of the program from two major releases to four major releases. Also, in 2012 under the BCL framework, the DEAMS program was restructured for a second time to include six major releases that will be deployed incrementally beginning with Increment 1 (GAO, 2013).

Since establishing its first acquisition program baseline (APB), DEAMS had not experienced a schedule delay; however, the program experienced a critical delay in establishing this first APB (GAO, 2013). Once again, the program began in 2003 and the first APB was not established until nearly a decade later in February 2012. Essentially, the acquisition process had been underway for almost 10 years before it developed a robust estimate for how long it was going to take to be developed and implemented (GAO, 2013). Some of the schedule delays were attributed to the complexity of reengineering business processes and design issues. Also, evolving requirements and testing issues served to delay the schedule, which, of course, have been identified problems within the traditional acquisition system.

Although the BCL framework was authorized for use in 2010, implementation of the framework has been slow as the DEAMS program is one of only a few programs currently using BCL. However, according to the Deputy Chief Management Officer (DCMO), Ms. Elizabeth McGrath, the DoD is in the process of transitioning several major IT programs to the BCL framework (Information Technology and Cyber Operations, 2013). Since the BCL framework is relatively new and implementation of this acquisition strategy has been slow, there is little to no data on the success rate or proof of concept. However, the potential benefits of BCL have been articulated and many within the DoD stand behind this new acquisition strategy, especially as it relates to DEAMS. According to the DCMO, “through the use of this [BCL] approach, DEAMS has integrated traditionally stove-piped processes and enabled tight integration between the functional sponsor [or end user] and the program office” (Information Technology and Cyber Operations, 2013). But, again, there is no conclusive evidence or data, as of yet, to suggest that the BCL framework will resolve the systemic problems that have caused major delays in acquiring IT systems within the DoD. With this being the case, Chapter IV will take a closer look at the BCL solution and that of others who have recommended solutions in order to assess the likelihood of success in fixing the DoD's IT acquisition system.

IV. BUSINESS CAPABILITY LIFECYCLE: POTENTIAL BENEFITS, SHORTFALLS, PROBLEMS, AND OTHER SOLUTIONS

A. POTENTIAL BENEFITS OF BCL

The premise of BCL is to provide an acquisition process for information technology that is based on successful commercial practices for the rapid acquisition and continuous upgrade and improvement of IT capabilities. Furthermore, the process is designed to be agile in order to deliver meaningful increments of capability in a shorter time span, ideally 12–18 months or fewer (see Figure 9).

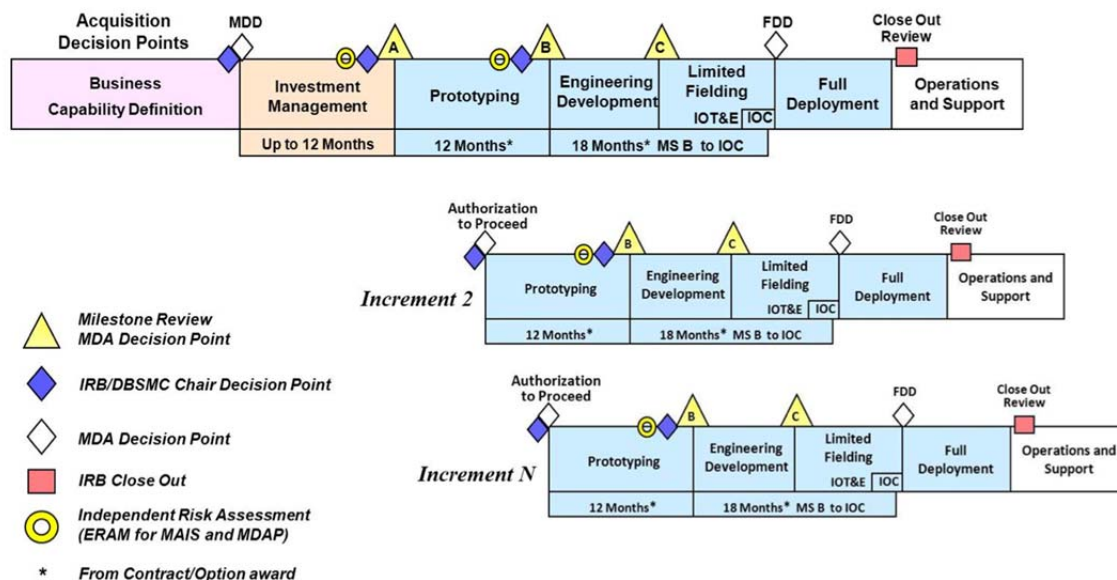


Figure 9. BCL Iterative Incremental Process (From USD[AT&L], 2013)

There are several potential benefits of using the BCL framework. First, the BCL framework is tailored for business systems not for weapons platforms. Also, the framework is more business oriented and avoids issues such as implementing solutions without fully understanding business needs. Second, BCL consolidates traditional requirements, investment, and acquisition processes

under a single governance structure (e.g., Investment Review Board, or IRB). The establishment of the IRB addresses the oversight and governance issues that were experienced under the traditional acquisition system. Third, the BCL is a more agile and flexible process that can be tailored to specific needs. Fourth, there is a focus on implementation and not on documentation. BCL minimizes the paperwork that has served to slow down the IT acquisition process. BCL's core documents are the Business Case and the Program Charter. The Business Case provides an integrated, executive-level justification for the recommended approach to solving the defined problem, while the Program Charter documents the managerial methods, responsibilities, and governance needed to successfully execute the program (Office of the Deputy Chief Management Office, 2012). Also, the Business Case is the only document used for the approval process. Essentially, these two documents integrate, summarize, and/or replace content that had been used under the traditional acquisition system for making executive-level decisions (BCL, 2012). Lastly, the BCL framework can potentially offer greater transparency and visibility, which will enable senior decision makers to affect outcomes (Office of the Deputy Chief Management Office, 2012).

B. BCL SHORTFALLS, PROBLEMS, AND POTENTIAL PROBLEMS

When the BCL framework was first introduced in June 2011, there was much optimism that significant improvements were on the way; however, this optimism quickly faded as efforts to further define this new IT acquisition process began to stall (Gilligan, 2012). Progress began to stall as the result of significant impacts on various DoD processes that were created by proposed funding changes or the lack thereof, program implementation, and a shift to a portfolio-based construct across requirements (Gilligan, 2012). As discussions on these issues created gridlock among many acquisition executives and stakeholders, other efforts to further define the BCL process were also stymied. To further exacerbate the situation, over the past 2 years, IT acquisition reform efforts have been less of a priority for the DoD due to fiscal concerns related to reductions in the Defense budget. Nevertheless, the DoD remains committed to the new BCL

process, as continual improvements in the IT acquisition process are planned in revisions to the DoD's 5000 series acquisition directives (Gilligan, 2012).

For now, the DTM continues to set guidance for the BCL and the acquisition of DBS programs. As stated in the BCL implementation guidance, the new BCL framework is a "first step" at streamlining the acquisition process for business systems (DoD, 2010). In fact, BCL is still considered to be within its pilot phase as it is still awaiting official indoctrination into DoDI 5000.02. More importantly, the BCL model is described as a mandatory guideline but tailoring consistent with statute and sound business practice is encouraged (USD[AT&L], 2013). Like any framework, BCL is an imperfect model of reality, but it is useful in addressing many of the issues that exist within the IT acquisition system. Essentially, the problems addressed in Chapter II regarding the misapplication of the traditional acquisition framework to IT acquisition, legislative and oversight issues, and requirements, appear to be addressed in the new BCL framework, at least in theory because again, there is no data as of yet on the success of the process.

Although certain problems are addressed, there still exist other problems, potential problems, and shortfalls within the BCL process. Due to BCL being an imperfect solution, as recommended tailoring implies, there remain issues regarding its limited application, the acquisition funding process, program testing and evaluation, and acquisition workforce concerns and management issues that need to be further addressed. Also, potential problems exist in the timelines offered by the BCL framework and the promise of a rapid acquisition process, which, again, has not been validated. Another potential issue exists in the structure or process of the BCL framework and its resemblance to the traditional acquisition framework. These issues will be further discussed in the next three sections.

1. BCL Framework Similarities to the Traditional Acquisition Framework

A potential problem in the BCL framework is that this new framework may not produce the improvements predicted because it is not remarkably different from the traditional acquisition framework. Fundamentally, the BCL was designed to be different from the traditional acquisition system, but compositionally it is very similar. For instance, there are seven lifecycle phases and five decision points (Milestones A, B, and C, a materiel development decision, and a full deployment decision) in the BCL process. Along with the five decision points, six of the seven developmental phases are consistent with or similar to the traditional Defense Acquisition System framework in regard to the traditional framework's five phases. Moreover, one phase (production and deployment) in the traditional Defense acquisition system framework corresponds to two phases (limited fielding and full deployment) in the BCL framework (USD[AT&L], 2013). The only significant differences between the two frameworks are the BCL's Business Capability Definition phase at the start of a program and the multiple developmental iterations and their associated timelines. This similarity to the traditional framework begs the question whether the new framework will bring about significant changes or produce the same stagnation that has plagued IT acquisition in the past. With no progress data available thus far, it is too early to tell if this new framework will yield the predicted improvements in speed, cost, and effectiveness of the IT acquisition process.

An argument can be made that the iterative incremental aspect of the BCL process will be the difference maker; however, this concept was not recently created but has been an aspect of evolutionary acquisition since its inception. Moreover, the iterative incremental development ideas, as well as the BCL tenets, are not new concepts but have been around for several years. The roots of iterative, incremental development (IID) methods can be traced back many years. For instance, in 2002 the Under Secretary of Defense for Acquisition, Technology, and Logistics issued a memorandum setting forth a model based on

multiple delivered increments and multiple spiral cycles within each delivered increment (NRC, 2010). Furthermore, the basic framework for BCL was recommended in the 2009 Defense Science Board report. Although it was not named the “Business Capability Lifecycle,” the basic elements (i.e., iterative development) were included in the report as a recommendation for a new IT acquisition system.

2. BCL’s Limited Application

One BCL shortfall is that it is limited in its application. While the BCL process is applicable across the DoD IT Enterprise, the process does not apply to all categories of systems across the IT spectrum. In fact, the BCL process is applicable only to systems such as networked IT systems (e.g., command and control and business systems); however, IT hardware requiring unique development and requisite production decisions will not use the BCL process (Bellomo, 2011). In other words, IT projects employing the new BCL process will not design unique hardware or conduct technology development. In fact, IT projects requiring those activities will use the traditional DoD acquisition system in an effort to ensure that appropriate focus remains on designing and developing the unique hardware (Bellomo, 2011). Moreover, business system modernization programs meeting a certain criteria (i.e., total cost over \$1,000,000) are required to use the BCL framework; however, for projects less than one million dollars, those projects will have to revert once again to the traditional acquisition system. Essentially, the BCL process does not apply to or attempt to solve IT acquisitions problems for all IT systems.

3. BCL Timeline Concerns

Another shortfall is that the BCL timelines, albeit incremental and shorter, are still too long when all increments are combined to complete a program in its entirety and deliver capabilities to the end users. As stated in the DTM, when a Major Automated Information System (MAIS) DBS employs the BCL or incremental approach, all functional capabilities associated with a given

increment must be achievable within 5 years from when funds were first obligated (DoD, 2010). Also, all DBS programs that are not MAIS must achieve Initial Operating Capability (IOC) within 5 years from Milestone A, which potentially means more time will be spent before capabilities are matured and into the hands of end users. The fact is that some IT projects are likely to take the full 5-year period based on project requirements or even due to the allowance of that specific amount of time.

Five years is an inordinate amount of time for an IT program to reach IOC or to be provided to the end user, especially if a system needs to fulfill time-critical operational requirements. For instance, time-critical operational requirements are extremely important in regard to cyber security. Moreover, identifying an agile and adaptable acquisition process that can field new IT capabilities and services in relatively short and responsive time frames in order to counter or prevent cyber threats is a pressing issue for the U.S. Navy. The U.S. Navy's Program Manager, Warfare (PMW) 130, an office in the Navy's Program Executive Office for Command, Control, Communications, Computers, and Intelligence (C4I), is focused on rapidly fielding innovative IT capabilities in order to secure the cyber domain, assure end-to-end information, and enable decision superiority (Porche et al., 2012). According to a 2012 study conducted by the Research and Development (RAND) corporation,

[PMW] requires an acquisition and fielding cycle that can deliver hardware security products within 12–18 months, software security products within six to 12 months, and incremental development for both hardware and software every three months. These time frames are far shorter than the traditional acquisition cycle time, which can be 36 months from concept approval to initial operational capability or eight to 10 years for full operational capability. (Porche et al., 2012)

This statement is mostly in the context of the traditional acquisition system; however, it applies to the BCL process as well. According to PMW, the Navy would like to follow the BCL's iterative and incremental development process, but it is apparent that the BCL offerings do not meet the desired timelines

(i.e., incremental development for both hardware and software every three months) in order to address emerging cyber threats (Porche et al., 2012). Consequently, the 2012 RAND study sought to identify ways to accelerate or bypass the acquisition process in response to the unique demands of PMW information technology and cyber programs. Ultimately, RAND recommended a distinct acquisition system for emerging needs that could be handled through a separate process and budget (Porche et al., 2012).

Another potential BCL timeline issue that can create delays and undermine the intent of the BCL process is a failure to strictly adhere to the iteration time-box or the deadline-driven approach to system development. As described in Chapter 12 of the Defense Acquisition University (DAU) website, the timelines for the phases of BCL must be taken into consideration during program planning, scoping, and Business Case development because any violations of these timelines require revalidation of the Business Case that can potentially slow down the delivery of capability to the user (DAU, 2012). Table 1 outlines BCL timelines that may be subject to delay if not strictly adhered to, whether it be for a legitimate reason or not.

Decision Period	Time Allotted
Materiel Development Decision (MDD) to Milestone (MS) A	12 months
MS A to IOC*	Within 5 years
MS A to Full Deployment Decision (FDD)	Within 5 years (or if no MS A, from when the preferred alternative was selected by the MDA)
MS A (contract / option award) to MS B	12 months or less***
ATP** (contract / option award) to MS B	12 months or less***
MS B (contract / option award) to FDD	18 months or less***

Table 1. BCL Timelines (From “DBS-specific Criteria,” 2012, June 5)

Also, another timing issue involves the Business Capability Definition (BCD) Phase because there is no set time limit for this phase to be completed. As discussed in Chapter III, the BCD phase is conducted at the very beginning of the process and consists of an analysis of a perceived business problem or capability gap and is an important first step as the new framework relies heavily on this phase being done correctly. But also, the BCL timeline depends on the Business Definition Phase being done in an appropriate amount of time that is consistent with the goal of timely acquisition.

Timing is key for the BCL process to work effectively and this process depends on the time-boxing or a deadline-driven approach. In using the time-box method, work items can slip from one iteration to the next, but iterations are completed according to schedule, thus affording the opportunity to quickly identify erroneous estimates of the time required to complete deliverables and ensuring continuous user input regarding priorities (NRC, 2010). Although identifying erroneous time estimates and receiving user feedback is of value, the fact is that when work items are allowed to slip from one iteration to the next iteration, so do capabilities. Also, according to the DTM, functional capabilities that are not supported by adequate cost estimates, mature technologies, or otherwise not ready will be deferred to subsequent program increments (USD[AT&L], 2013). This deference or allowing of work items to slip will inevitably create delays in capabilities being delivered to end users.

There are plenty of advantages to the incremental development concept, which is considered a commercial best practice; however, one disadvantage or drawback is that the needed capability may not be acquired until much later in the process or maybe even acquired at the tail end, which is at the 5-year mark in the case of the BCL process. Essentially, the BCL incremental process solves the capability gap problem a little bit at a time or piecemeal, but when done over a 5-year period, it is not much different than a lengthy acquisition process solving the entire problem over the same time span, except for maybe users getting an opportunity to have some functionality in hand (e.g., prototypes). According to the

Deputy Chief Management Officer Elizabeth McGrath (2011) in a HASC committee on improving management and acquisition of IT in DoD, “[we will group] capabilities such that they are delivered in a spiral fashion and not try and solve the entire issue at the get-go” (Improving Management and Acquisition of Information Technology Systems in the Department of Defense, 2011). Solving part of the problem still leaves a problem that can potentially linger for years. Also, delivering some capability and then adding to it in future iterations in order to make a system more effective in the long run begs the question of whether this method will provide enough capability in a timely manner or when it is needed. The iterative incremental method is, indeed, a proven technique as it is a commercial best practice; however, the 5-year period provided to execute this process does not work well enough in every scenario, especially in the case of the U.S. Navy’s cyber threat requirements.

Overall, the BCL process appears to continue to allow too much time to be spent acquiring a system considering that technology advances every 18 months. It does not seem practical for the DoD to ever keep exact pace with the advancements in technology given its bureaucracy; however, given commercial industry practices, it is practical that the DoD can do better than what the BCL framework currently offers. In fact, there are other proposed solutions to the problems identified in Chapter II that will be discussed in the next section.

C. OTHER SOLUTIONS AND FRAMEWORKS

Various studies of the DoD’s IT acquisition process have been undertaken in the past few years in an effort to propose solutions to improve the overall effectiveness and efficiency of the IT acquisition process. Many of these studies propose models or frameworks that are designed to facilitate a more timely acquisition process. The following three frameworks, proposed by three separate entities, offer similar solutions similar to the BCL process; however, each one provides additional methodologies and detail that can produce shorter timelines.

1. Two Models for IT Acquisition for Software and Hardware Development

In November 2009, approximately 7 months after the Defense Science Board (DSB) released its report on the failures of the traditional IT acquisition system, the Defense Information Systems Agency (DISA) requested that the National Research Council (NRC) conduct an assessment of the efficacy of the DoD's acquisition and test and evaluation (T&E) processes as applied to IT (NRC, 2010). In response, the NRC formed a committee of IT systems acquisition and T&E experts; commercial software developers, and software engineers, computer scientists, and other academic researchers that was tasked with the following:

- Evaluate applicable legislative requirements
- Examine the processes and capabilities of the commercial IT sector
- Examine the DoD's concepts for systems engineering and testing in virtual environments
- Examine the DoD acquisition environment
- Recommend how to improve the acquisition, systems engineering, and T&E processes to achieve the DoD's network-centric goals. (NRC, 2010)

To complete these tasks, the committee reviewed IT acquisition documents concerning the process, held briefings from commercial and military experts in IT systems acquisition, and held internal deliberations among committee members to determine issues and recommend solutions. Like the DSB report and many other studies that have recommended reforms to the Defense acquisition system's processes and rules that govern the development, procurement, testing, and fielding of new capabilities, the committee concluded that there is a need for a unique acquisition process for IT (NRC, 2010). Furthermore, the committee reached the same fundamental conclusion of other studies but added another dimension in defining differing types of IT systems and suggested an acquisition process for each. Thus, one of the most significant recommendations

was the NRC's proposal of two different acquisition methods, one for hardware and one for software acquisition.

For software acquisition programs, the model is referred to as Software Development and Commercial off-the-shelf (COTS) Integration (SDCI) framework. SDCI was designed for IT programs that are focused on the development of new software to provide new functionality or to integrate commercial off-the-shelf (COTS) components (NRC, 2010). The hardware model is referred to as COTS hardware, software, and services (CHSS) framework. CHSS was designed for the acquisition of COTS IT hardware, software, or services to exploit commercially available products and services without modification to meet DoD needs, although modification to meet environmental requirements in a deployed environment can also be addressed in this category of programs (NRC, 2010). Both SDCI and CHSS programs are based in commercial best practices and are especially suitable for acquiring IT systems that support DoD information enterprise requirements (NRC, 2010).

Within IT development, there are two basic types of IT developmental processes: hardware and software. Given their distinct nature, each requires different developmental processes. For instance in software, the number of lines of executable code is increasing drastically, which further exacerbate the challenges of IT development (HASC, 2010). Moreover, software projects are more difficult to manage than hardware projects for a few reasons: 1) software is not a tangible product or physical system whereas hardware is and you can see and measure the developmental process better than you can for software; 2) in software projects, it may not be obvious until late in the project that the code is meeting or not meeting the requirements, whereas with hardware you will be able to tell sooner if not right away; and 3) unlike hardware projects, testing and integrating of software products is not simple and can yield more problems late in the project.

In regard to CHSS or hardware components of IT programs, they are most heavily influenced by Moore's law, which, again, predicts the doubling of capacity

per unit expenditure every 18 months, so obsolescence is a concern if hardware projects take years to develop (NRC, 2010). In contrast to hardware components of IT programs, the software components are most heavily influenced by the fast pace of technology change in the Internet environment and the difficulty at times to define requirements (NRC, 2010). In both types of IT developments, rapid change is a fundamental factor that must be addressed, and iterative, incremental development (IID) strategies are indeed appropriate ways to address this rapid change, especially when done quickly (NRC, 2010). However, the nature of the capability increments should differ for hardware and software components because of the different issues that drive them. Thus, the SDCI and CHSS frameworks were designed to capture these differences in their developmental approaches. Following are descriptions of the proposed program phases and decision milestones for both the SDCI and CHSS programs.

Software Development and Commercial off-the-shelf (COTS) Integration (SDCI) programs consist of the following decisions and phases as shown in Figure 10:

- **Material Development Decision.** The purpose of the Material Development Decision (MDD) is to validate the need for material development to address the requirement for a new or improved mission capability as a result of a projected deficiency or obsolescence in existing systems that cannot be addressed appropriately through continued evolution of those systems; a technological opportunity; or an opportunity to reduce operating cost. An additional purpose is to gain approval of a draft top-level ("big-R") capability description and draft concept of operations (CONOPS) for the capability.
- **Business Case Development.** This phase enables leadership to make an informed, rational initial decision to invest in a program. It should further evolve the draft capability description and draft CONOPS and develop alternative approaches or system concepts for the proposed program. It should formalize the approach to quantify costs that will be incurred in the program and benefits expected to be achieved by the program, and conduct an analysis of the trade-offs among the alternatives to assess the anticipated costs and benefits of each in order to recommend a preferred

approach or system concept. It should also identify major risk factors that could jeopardize success and propose mitigation strategies for each major risk factor. In so doing, it should develop a proposed schedule and budget for the capability increments from the initial capability increment through to the final capability increment and anticipated lifecycle costs, and propose an allocation of the top-level requirements identified in the draft capability description to the capability increments.

- Milestone A: Planning, Analysis, and Concept Demonstration Decision Phase. The purpose of this decision is to validate the business case and analysis of alternatives, and to authorize entry into the initial Planning, Analysis, and Concept Demonstration Phase.
- Increment 1 Planning, Analysis, and Concept Demonstration Phase. The purpose of this phase is to provide further validation of the recommended alternative approach and its projected costs and benefits prior to formal initiation of the program. Also, this phase can use prototyping to demonstrate key features of the proposed solution.
- Increment 2 Planning, Analysis, and Concept Demonstration Phase. The purpose of this phase is to allow for subsequent planning and analysis phases after the initial one leading to the initial Milestone B, Program Initiation Decision.
- Milestone B: Program or Capability Increment Initiation Decision. The purpose of this decision is to validate the overall refined capability description and how big-R requirements are allocated across all subsequent increments, and the time-phased scope of deploying capability across the increments. It must also validate the proposed small-r refined requirements allocated to the next increment, together with the plan for how the increment will be executed.
- System Development and Demonstration (SDD) Phase. The purpose of this phase is to develop the next increment of capability through a learning and communicating cycle of time-boxed iterations informed by the end-user's perspective and integrated testing and evaluation as key components of the learning and communications process throughout the iterations.

- Milestone C: Capability Increment Deployment Decision. The purpose of this decision is to assess the risk versus benefit of deploying the capability developed during the SDD phase to the subset of end users within the intended deployment scope. This is a marked departure from the current approach of assessing whether a fixed set of requirements including key performance parameters (KPPs) has been achieved with cost and schedule floating to whatever level is necessary to achieve that objective. In this approach, the increment is time-boxed and executed with the cost and schedule constrained to the baseline set at the previous Milestone B decision and the degree of success in meeting the big-R requirements set for the increment.
- Deployment Phase. The purpose of this phase is to deploy the developed capability to the intended subset of end users. If the capability developed during the SDD Phase and its deployment approach is straightforward, the Deployment Phase can be a very simple and straightforward activity. If, however, the capability is complex, and especially if there are interdependencies with other programs, complex installation procedures not suitable for “point-and-click” installation by the end user, and/or unique training requirements, significant planning and effort may be required to deploy the capability.
- Operations and Sustainment Phase. The purpose of this phase is to support all previously deployed versions of a capability still in operational use. This support includes activities such as operating an end-user help desk and responding to problems encountered in operational use of the capability, including the development and distribution of patches and maintaining a configuration status accounting baseline for all installations of the capability (NRC, 2010).

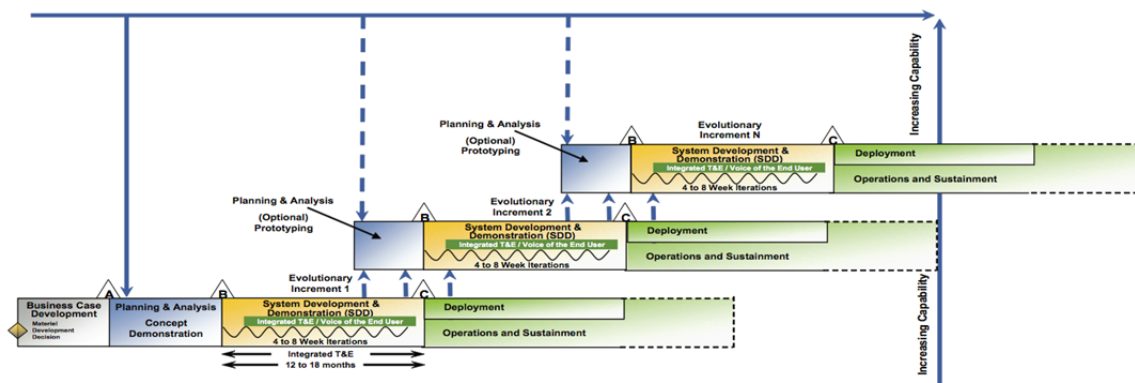


Figure 10. SDCI Framework (From NRC, 2010)

As depicted in Figure 11, COTS hardware, software, and services (CHSS) programs consist of the following decisions and phases which are the same or similar to SDCI with exceptions where indicated:

- **Material Development Decision.** The purpose of this phase for CHSS is the same as for SDCI programs.
- **Business Case Development.** The purpose of this phase for CHSS is the same as for SDCI programs, though with much greater emphasis placed on aligning the business strategy and investment strategy with the technical incremental capability strategy. Correspondingly, there should be much less emphasis on a concept of operations (CONOPS) for purely unmodified COTS hardware, software, and services.
- **Milestone A: Planning, Analysis, and Concept Demonstration Decision Phase.** These decisions for CHSS are conceptually similar to those for SDCI programs; however, the difference at this decision milestone and in the subsequent program phases is that concept demonstration should be undertaken if and only if there are clear issues or questions that must be resolved through demonstration that cannot be resolved in successive capability increments. This will frequently not be the case for the use of unmodified COTS products or services. As such, concept demonstration should be regarded as optional, with a bias to not performing it for most programs. The principal focus should be on the planning and analysis activities.

- Increment 1 Planning, Analysis, and Concept Demonstration Phase. The purpose of this phase for CHSS is similar to SDCI programs with the exception of the change in emphasis discussed in Milestone A for CHSS programs. Furthermore, requirements will typically focus on capability, capacity, and key nonfunctional requirements (e.g., operational availability and environmental qualification for hardware).
- Increment 2 Planning, Analysis, and Concept Demonstration Phase. The purpose of this phase for CHSS is the same as that for the second increment in SDCI programs. However, for subsequent planning and analysis phases after the initial one leading to the initial Milestone B, Program Initiation Decision, and the process can be substantially abbreviated.
- Milestone B: Program or Capability Increment Initiation Decision. The purpose of this decision is the same for CHSS as those for SDCI programs.
- System Development and Demonstration (SDD) Phase. As with SDCI programs, the purpose of this phase for CHSS is to provide the next increment of capability. Since developmental efforts are not involved, the nature of the learning and communications cycle and the role of the end user and other stakeholders change, as does integrated testing and evaluation. Also, since the focus is on COTS software configuration, hardware integration, or hardware ruggedization to meet environmental qualification requirements, and not on software development, time-boxed iterations can still play a role but are not as critical as they are for SDCI programs.
- Milestone C: Capability Increment Deployment Decision. The purpose of this decision is the same for CHSS as SDCI programs, with one addition: validating the attainment of an environmentally qualified first article for COTS hardware programs targeted at deployable units. As with SDCI programs, if there are subsequent increments, this Milestone C decision should ideally be conducted coincident with the Milestone B decision for the subsequent increment since many of the factors affecting the deployment decision can also materially affect the composition of the next increment.

- Deployment Phase. The purpose of this phase for CHSS is the same as it is for SDCI programs.
- Operations and Sustainment Phase. The purpose of this phase is the same for CHSS programs as it is for SDCI programs (NRC, 2010).

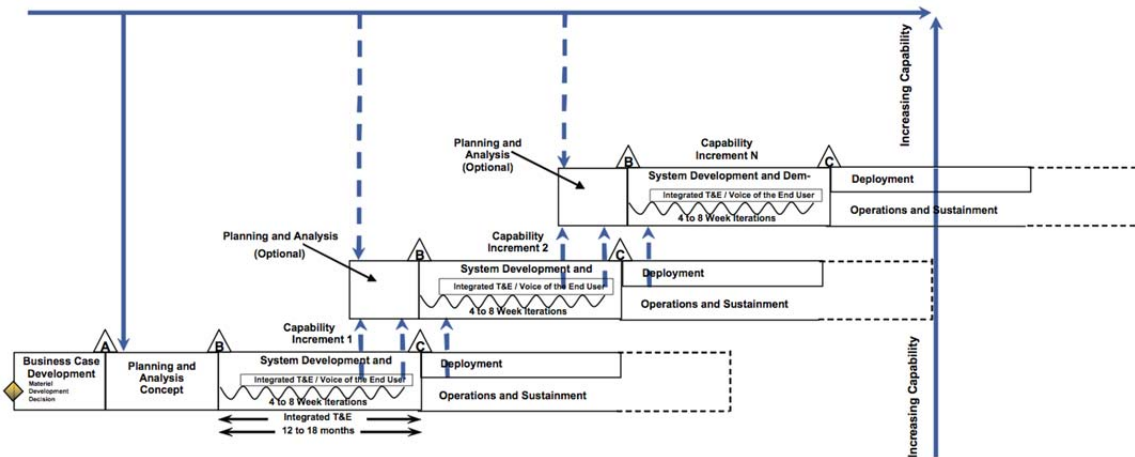


Figure 11. CHSS Framework (From NRC, 2010)

Like the BCL framework, SDCI and CHSS frameworks use phases and decision points that are structured within an IID format with time-boxed capability increments; however, SDCI and CHSS increments are planned in 4 to 8 week iterations and do not take longer than 12 to 18 months to deliver meaningful capability to end users as shown in Figures 10 and 11. Essentially, the NRC provides two formats for IT software and hardware development that can be completed much quicker than the time frame indicated for the BCL process mainly because SDCI and CHSS account for the differences in developmental types. Although BCL advertises “flexible and tailorable processes,” it does not go as far as breaking its framework down for the different types of developmental processes for IT.

As is suggested in the BCL implementation guidance, tailoring of the BCL framework is welcomed (USD[AT&L], 2013). With that, tailoring to account for the different strategies needed to address the different needs of both hardware and

software development could potentially serve to expedite the BCL process which again, can take as long as 5 years. Essentially, the BCL acquisition process should incorporate the processes and timelines found in both SDCI and CHSS process models. Doing so has the potential to better address the issues for the Navy's cyber security IT needs and the associated speed needed to acquire certain technologies.

In regard to the overall change recommendations to the IT acquisition process, the NRC's models have similar attributes similar to the BCL framework which include an emphasis on shorter cycle times to deliver the best IT to the warfighter; streamlined processes for requirements definition, budgeting, operational testing, and oversight; and the decomposition of larger programs into smaller projects or increments that are delivered to the user in an evolutionary manner (NRC, 2010). NRC's emphasis on shorter cycles include time-boxed incremental deliveries of usable capabilities and time-boxed iterations within each capability increment that are focused on nonfunctional requirements and on an architecture that is suited for the intended operating environment (NRC, 2010). Furthermore, NRC's streamlined process for requirements will focus on "big-R" requirements during early planning and performance of integrated testing, and evaluation will be commensurate with risk and benefit. The NRC's employment of IID methods incorporates the voice of the end users as well as provides an acquisition governance process that empowers end users in the acquisition oversight decision processes (NRC, 2010). The decomposition of larger programs and decisions driven by risk and benefit will provide an incremental build-out of the architecture in scope and scale sufficient to meet the needs of the functional requirements of each capability increment (NRC, 2010). Ultimately, the NRC's recommendation offers much of what BCL offers, except the timelines provided by the NRC frameworks implement capabilities much sooner.

2. Four Models for IT Acquisition for Software and Hardware Development

In November 2009, around the same time as the NRC's study, Acquisition Solutions Incorporated (ASI) conducted its own assessment of the IT acquisition problem within the DoD. ASI engaged with the Deputy Assistant Secretary of Defense for Command, Control, and Communications, Intelligence, Surveillance, and Reconnaissance and the DoD CIO to develop an alternative model for IT acquisition based on the DSB 2009 report (Gilligan et al., 2009). ASI focused on the concepts presented in the DSB report in order to develop an implementable acquisition process to quickly comply with the new congressional mandate and to achieve rapid delivery of information technology solutions that meet government users' needs (Gilligan et al., 2009). AIS noted the following factors that influence IT acquisition processes:

- The technology for information systems exhibits continuous and very rapid evolution
- There are an increasing number of commercial off-the-shelf (COTS) components available
- Users' requirements for an information system evolve as users gain experience with early capabilities
- Most IT systems or services are components of a larger "system of systems." (Gilligan et al., 2009)

Furthermore, ASI cited the differences in the types of IT developmental programs just as the NRC study had described. ASI also emphasized that these differences must be accommodated in the acquisition processes government organizations employ in order for the IT acquisition process to be effective (Gilligan et al., 2009).

Ultimately, ASI developed a set of guidelines for the DoD to rapidly acquire new IT systems. These guidelines are built on industry best practices, lessons learned from both industry and government, and are tailored specifically for IT acquisitions. Also, the ASI model is built on agile development, test, and contracting methods to achieve rapid delivery of products (Gilligan et al., 2009).

Accordingly, ASI established six principles that underpin its proposed IT acquisition models:

- Divide requirements for larger IT solutions into smaller projects.
- Use acquisition “process templates” that recognize the differences among types of IT efforts.
- Use CIO and acquisition governance authorities as well as end-user approval for key decisions in the IT acquisition process.
- Employ standard IT “platforms” as the infrastructure target for newly fielded capabilities.
- Provision and employ an enterprise-wide systems engineering, test, and integration capability.
- Use portfolio management-like processes for project initiation and funds allocation.

ASI’s Principle 1, dividing requirements, involves the same concept used in the BCL framework, which focuses on small, incremental projects to drive rapid fielding of user capabilities. Also, IT requirements are defined at a high level at the start of a project, with detailed requirements evolving throughout the project (Gilligan et al., 2009). ASI’s acquisition model uses small IT projects and interactively evolves the results of these smaller efforts into the larger system capability to deliver and field operational capabilities in 6–12 months (Gilligan et al., 2009). Additionally, through agile developmental methods, the IT project’s developer, the knowledgeable user, and the tester work together on each increment of capability which results in rapid delivery of useful capability and avoids surprises in the fielded system (Gilligan et al., 2009). Furthermore, as the increments of capability are fielded, continuous user feedback is used to tailor the requirements and priorities for successive increments. Essentially, smaller projects permit less overhead, less risk, and more rapid fielding, which helps to ensure that the program is meeting user needs. Much of this principle mirrors the BCL concept for requirements and smaller increments; however, the timeline intends to deliver capabilities quicker due in large part to Principle 2.

Principle 2, use of acquisition “process templates,” is similar to NRC’s recommendation of maintaining different process models based on the type of IT being acquired. Once again, BCL makes reference to being a “flexible and tailorable process,” but it does not go as far as explaining this flexibility and how its framework can be tailored. ASI noted that “as IT acquisition projects grow increasingly complex, the risks, acquisition activities, and oversight needs of individual programs grow more diverse” (Gilligan et al., 2009). Whether it is for a software product or COTS IT component acquisition program, there are inherently different risks and requirements to be met for each type. Therefore, it is necessary that the acquisition development and oversight process be tailored to meet the requirements of each type of acquisition. Thus, utilizing predefined acquisition process templates, each tailored for different types of IT projects, ensures that complex IT projects stay focused on those activities that are important for that particular IT acquisition type and increases the speed of the acquisition process (Gilligan et al., 2009). For a new IT acquisition model, and similar to what NRC recommended, ASI proposed four process templates that leverage best practices for four different types of IT acquisition programs and the inherent risks with each. The four templates identify the important acquisition activities needed to address specific risk areas; identify the key decisions points and the information needed to support the decision points; and define specific project planning activities, oversight decision points tied to risks, documentation needs, and decision event exit criteria (Gilligan et al., 2009). The four IT acquisition process templates are as follows:

- Process Template 1: Application Software Development and Integration—for projects involving software development and software integration
- Process Template 2: COTS Hardware/Software—for the purchase of non-modified commercial end items

- Process Template 3: Integrated COTS Capability—for projects requiring focused systems engineering to integrate a set of commercially provided hardware and/or software components
- Process Template 4: Commercially Provided IT Services—for efforts to procure IT services. (Gilligan et al., 2009)

Unlike BCL, acquisition process timelines for each of the four templates are measured in months, not years, which makes these models and ASI's concepts even more appealing. Process Template 1 and 2 are very similar to the NRC's Software Development and Commercial off-the-shelf Integration (SDCI) model and the COTS hardware, software, and services (CHSS) model in that they provide unique processes for acquiring these two different types of technologies. Although their processes and the names of their phases are different, they focus on the same areas and their associated timelines are similarly shorter than BCL. However, Process Templates 3 and 4 provide two different aspects of IT acquisitions. Figures 12 and 13 show the top-level diagrams of both Process Templates 3 and 4, respectively. The phases and decision points for these four process models are consistent with or similar to the phases and decision points found in the BCL framework and the NRC models. However, the most significant difference involves the quicker process timelines found in the four models.

Principle 3, use of CIOs, acquisition governance authorities, and end users for key decisions, is fundamental to ASI's recommend new IT acquisition process. The governance process, which involves the CIO community, the acquisition community, and the user community, focuses on three key governance areas: requirements definition, oversight of program management processes, and management of the use of information technologies (Gilligan et al., 2009). Each of the three communities brings separate but essential authorities and accountability to the acquisition oversight process, "the acquisition community provides program management and contracting expertise; the CIO community provides IT architecture, interoperability, standards, and information assurance expertise; and the user community brings expertise and understanding of user needs and priorities" (Gilligan et al., 2009). Furthermore, qualified representatives from each community are given the authority to make timely decisions regarding cost, schedule, and performance as well as the responsibility to ensure full transparency of the project status (Gilligan et al., 2009). Ultimately, this governance structure is vital to the proposed model and an effective IT acquisition system because "it helps to ensure that the right knowledge and authorities are available to make the decisions necessary to keep an IT project moving, to redirect it if needed, or to terminate a project when appropriate" (Gilligan et al., 2009). This principle, in comparison to BCL, is very similar to the governance restructuring found in BCL but the use of CIOs and the importance of effective management is given more emphasis.

Principle 4, use of standard IT platforms, seeks to avoid the issue of DoD organizations selecting hardware and associated software that use a combination of commercially available technologies that are assembled and configured by different systems integrators and result in a large variety of distinctly different hardware and software platforms that must be properly configured, tested, and managed throughout the lifecycle (Gilligan et al., 2009). This method of acquiring IT is problematic and leads to delays because "each program specifies, purchases, and qualifies its own unique platform for security,

interoperability and stability; is expensive, with significant duplication and unnecessary effort; and complicates security efforts” (Gilligan et al., 2009). Thus, ASI’s new approach to IT acquisition provides direction on the mission-unique IT software or COTS capabilities by using standard prequalified IT platforms that implement DoD IT standards and necessary security, and can be provisioned quickly (Gilligan et al., 2009). Lastly, these standard platforms can be made available immediately, which will enable DoD IT projects to rapidly take advantage of the benefits of agile development methods and to rapidly field state-of-the-art COTS IT products.

Principle 5, employment of an enterprise-wide test and integration capability, deals with the issue of government acquisition processes that often do not address IT integration and interoperability objectives until an IT project is already developed or in the process of being fielded. Thus, AIS emphasizes an organization-wide systems engineering process along with test and integration capabilities (TIC) to provide a way to ensure integration and interoperability of separately developed projects before fielding (Gilligan et al., 2009). Also, TIC provides a means to reduce project cost and schedule by eliminating the need for an individual IT project to maintain a separate and distinct test and evaluation facility (Gilligan et al., 2009). Additionally, TIC would be used to 1) conduct prototype evaluations or to demonstrate candidate technologies prior to a build or procurement decision, 2) test newly procured capabilities in a “system of systems” operational-like environment prior to fielding, and 3) ensure compliance and compatibility within established IT architectures and standards and other systems that exist within the target operational environments (Gilligan et al., 2009). Essentially, TIC addresses many of the testing issues that were described in Chapter II by providing a single environment for developmental, operational, and security testing of newly developed IT capabilities.

Principle 6, use of a portfolio management-like process for project initiation and funding allocation, is one of the most important principals because it addresses part of the funding issues. As discussed in Chapter II, acquiring

funding for IT projects, even high-priority projects, can take multiple years. Given the fact that IT advances a generation every 18 months and many mission-critical functions depend heavily on IT solutions, a rapid IT acquisition process requires an equally rapid funding process in order to be effective (Gilligan et al., 2009). Thus, ASI's new models offer a portfolio management-like process for allocating funding within the execution year and permit trade-offs between competing needs that will lead to more effective use of IT funds (Gilligan et al., 2009). So rather than budgeting and managing the execution of funding tied to one specific project, the DoD can respond to advances in IT, emerging and urgent needs, and the progress within ongoing IT acquisition projects in a more rapid and flexible manner (Gilligan et al., 2009). This flexibility provides the means to be able to move funding around within the portfolio in order to support new requirements discovered during IT developmental processes. This funding process would be similar to the DoD's use of working capital funds; in which funding for IT is allocated annually after examination of priority needs and project progress (Gilligan et al., 2009). Ultimately, this portfolio management-like approach eliminates the need to have full funding of the entire IT effort at project initiation in favor of incremental funding for each release (Gilligan et al., 2009). Unfortunately, the current PPBE process does not facilitate the ASI's funding concept. Furthermore, this proposed change to acquisition funding methods are contingent upon congressional approval or action, which can be difficult.

The six principles and four models proposed by ASI extend the concepts identified in the 2009 DSB report. Also, ASI concepts embody the best practices of industry as well as lessons learned from successes and failures within DoD IT acquisition. Through the implementation of ASI concepts, the DoD can achieve rapid acquisition of useful IT while providing needed and effective oversight. In comparison to the BCL process, ASI provides more granularity or emphasis in the areas of funding and the actual acquisition process given the four model or frameworks that account for different types of IT acquisition. Tailoring the BCL

process to account for the different process models and timely funding methods, as offered in the ASI models, can greatly decrease the acquisition timeline.

3. IT 360 Solution

Recognizing the unacceptably long IT acquisition process and the inherent problems within the entire system, former Under Secretary of Defense for Acquisition, Technology, and Logistics (USD[AT&L]) Jacques S. Gansler and William Lucyshyn, proposed an entirely new IT acquisition model in 2012. They developed a new IT acquisition process entitled “IT 360,” which is specifically tailored to meet the unique attributes of modern Defense business systems (Gansler & Lucyshyn, 2012). The label “IT 360” is a conceptual goal to mean that this process intends to complete one developmental cycle in approximately 360 days or fewer (Gansler & Lucyshyn, 2012). Moreover, IT360 contains a series of initiatives that intends to enhance the speed and efficiency with which DoD acquires its IT systems. These initiatives are as follows:

- Spiral development
- Smaller, quicker to deliver, useful sets of capabilities
- Rapid delivery
- Greater use of COTS products
- Aggressive use of prototypes and demonstrations
- Continuous and integrated testing
- Decentralized execution
- Inclusion of end users
- Enhanced competition (Gansler & Lucyshyn, 2012)

These nine initiatives provide a means for the IT 360 process to deliver IT in a timely manner. The IT 360 process is based on the prevailing commercial model for developing software, which is the spiral development method or a cyclical approach to incrementally growing a system's capabilities while decreasing risk (Gansler & Lucyshyn, 2012). Also, spiral development facilitates large programs

being broken into smaller, agile increments that are responsive to innovation and allow for the rapid development of new capabilities.

Rapid development and time-to-delivery are key objectives for every IT program, and IT 360 employs a scheduling concept that allows the traditional milestones and key decision points to be established early in the process and scheduled in much shorter periods (Gansler & Lucyshyn, 2012). For example, in IT 360, the time allocated to complete a business case and program implementation plan is short (approximately 30 days), unlike the undefined timeline for this phase in the BCL process. In an effort to maintain shorter timelines, IT 360 promotes greater use of COTS products that consist of proven capabilities (i.e., pre-tested and pre-certified) that can accelerate deliveries of capabilities within the established time frame (Gansler & Lucyshyn, 2012). With that, the IT 360 process encourages the use of prototypes that can be used to expedite source selection, reduce technical risk, and enable the selection of developers with a demonstrated ability to implement the required IT system for the end user.

IT 360 has several other important factors that are beneficial to the IT acquisition process. For instance, IT development requires a continuous cycle of testing in order to detect security vulnerabilities and to avoid hyper-specified and unnecessary features (Gansler & Lucyshyn, 2012). Also, this continuous testing permits operational experience to inform future requirements that will ultimately ensure that IT systems are optimally suited to meet the needs of their intended users (Gansler & Lucyshyn, 2012). Additionally, IT 360 promotes decentralized execution and frequent product reviews. These methods alleviate the need for burdensome oversight and its' associated documentation requirements while at the same time including users and other stakeholders throughout the process thus allowing program personnel and developers to better understand user requirements (Gansler & Lucyshyn, 2012). One other important factor is competition and IT 360 enables enhanced competition when new iterations are launched. Competition is an important component to effective acquisition

because it promotes efficiency and improved market performance by providing the defense industry with an incentive to develop better products quicker and at lower costs (Gansler & Lucyshyn, 2012).

IT 360 utilizes both an evolutionary (or spiral) and an incremental developmental approach to IT acquisition (Gansler & Lucyshyn, 2012). Evolutionary development is an ongoing process of spiral development of system requirements, which are based on feedback loops from end users. Incremental development is essentially a process for implementing evolutionary acquisition yet there is a difference between evolutionary and incremental processes (Lorell, M. A., Lowell, J. F., & Younossi, O., 2006). In evolutionary development, the end-state requirements are not known in advance. This is an important conceptual distinction between evolutionary and incremental developments because unlike spiral or evolutionary development, the incremental development process assumes that the end-state requirements are known at the beginning of the developmental process. Thus, requirements can be known or unknown, and IT 360 is designed to deal with both scenarios. In using both an evolutionary and incremental approach, the initial IT 360 product iteration may not possess all of the desired capabilities much like every other proposed incremental solution; however, the IT 360 process adds functionality to the system's existing capabilities at a standardized, quick pace (Gansler & Lucyshyn, 2012).

The IT 360 framework and process consists of seven phases that interact in a spiral fashion. These phases consist of Program Initiation; Increment Requirement Identification; Initial Increment Level Material Development Strategy; Architectural Alignment and Development; Development, Demonstration, and Oversight; Increment Capability Delivery, and Operations and Maintenance. The seven phases of the IT 360 process and their objectives and timelines are summarized as follows and are depicted in Figure 14:

- Program Initiation Phase. The initiation phase lays the foundation for program acquisition in four distinct ways. First, initial market surveys are conducted to generate potential solutions and establish a successful acquisition strategy. Using this strategy, the high-level requirements for the program are determined. These high-level requirements (i.e., “big-R” requirements) specify general system capabilities. Less emphasis is placed on minor requirements (the over-specification of which often leads to cost overruns and delays); rather, minor requirements are deferred to future increments. Next, both the high-level requirements and the market surveys are used to establish the overall procurement strategy, which will inform future phases over multiple iterations. Once the strategy is established, program-level and portfolio-level governance are then created and initiated.
- Increment Requirement Identification Phase. During this phase, all potential solutions are considered, including COTS and other open-source solutions. With a total duration of approximately 30 days, the secondary goal of this phase is to ensure that capabilities are assigned to appropriate increments. By continuing the market surveys begun during the Program Initiation phase, program personnel work to ensure that the initial requirements meet as many user demands as possible, without front-loading onto early increments the more difficult, though perhaps nonessential, requirements. This is an important distinction over the traditional Defense acquisition system, which has a tendency to “waterfall” requirements, leading to increased rigidity throughout the process. This phase concludes with a material development decision (MDD).
- Initial Increment Level Material Development Strategy. During this phase, a procurement strategy that is both product-specific and increment-specific is devised. While much of this strategy was developed during the previous phase, it is during Phase 3 that program personnel delineate a highly structured, comprehensive business case (i.e., program justification) and a fully developed acquisition plan and develop a mechanism that ensures coordination of stakeholder involvement. With an approximate duration of 30 days, this phase finalizes development and planning for the initial increment. The Initial Increment Level Material

Development Strategy phase is completed upon the approval of a request for proposals (RFP) by the Program Governance Board (PGB).

- Architectural Alignment and Development Phase. After the release of an RFP to private-sector contractors, the Architectural Alignment and Development phase begins. This phase, which marks the beginning of system development, has a duration of approximately 120 days. Once the architecture is determined, a risk assessment is conducted via prototyping and other methods. Once it is determined that the architecture carries sufficiently low risk, Phase 4 concludes, which prompts the issuance of the capabilities development document (CDD) detailing why the system is needed; how it will be used; where the system will be located; who will need it; when it will be available; what the system is intended to do; how the system will be supported; and how much it will cost. Contracts are written to reflect the information contained in the CDD.
- Development, Demonstration, and Oversight Phase. The issuance of a CDD marks the beginning of the Development, Demonstration, and Oversight phase, as well as the contract award. With an approximate duration of 180 days, it is the longest phase of the IT 360 process but also the most crucial. At this milestone, the decision authority approves the acquisition strategy; enterprise contracting and buying strategy; increment level detailed requirements; and market and spend analysis, acquisition program baseline, program implementation plan, test plan, and documentation. During this phase, the program manager will manage the development and demonstration of the proposed IT solution for a release of capabilities within specified cost, schedule, and performance parameters. Additionally, during this phase, multiple iterations of the system may be developed and tested (T&E is integrated into each iteration). Upon the release of each iteration, stakeholder input, oversight, and, if appropriate, corrective actions are combined to guide development of the next iteration. When successful, the program manager can rapidly deploy the capability or continue to demonstrate the capability in a live operational environment, depending on the nature of the program.
- Increment Capability Delivery Phase. Assuming that the system fulfills the strategic, programmatic, and incremental requirements,

the PGB will authorize its entry into the Increment Capability Delivery phase. This phase has two main functions: full fielding and the transition to long-term operations and maintenance (O&M). The second function is the transition of the product to long-term O&M. This entails the creation or augmentation of a support structure specifically tailored to the capabilities of the newest product iteration.

- **Operations and Maintenance Phase.** The Operations and Maintenance phase oversees the creation or augmentation of a support structure specifically tailored to the capabilities of the released product. This entails complementary documentation and ongoing training in support of the recent release, refreshment of software, bug fixes, and administrative support. Entrance into this phase depends heavily on the user's satisfaction with the solution and willingness to use the IT capability in the operational environment. The support plan is executed to meet the operational needs of the IT system in the most cost-effective manner. This plan will identify strategies to respond to discrepancies, failure reports, and hardware and software updates and upgrades. (Gansler & Lucyshyn, 2012).

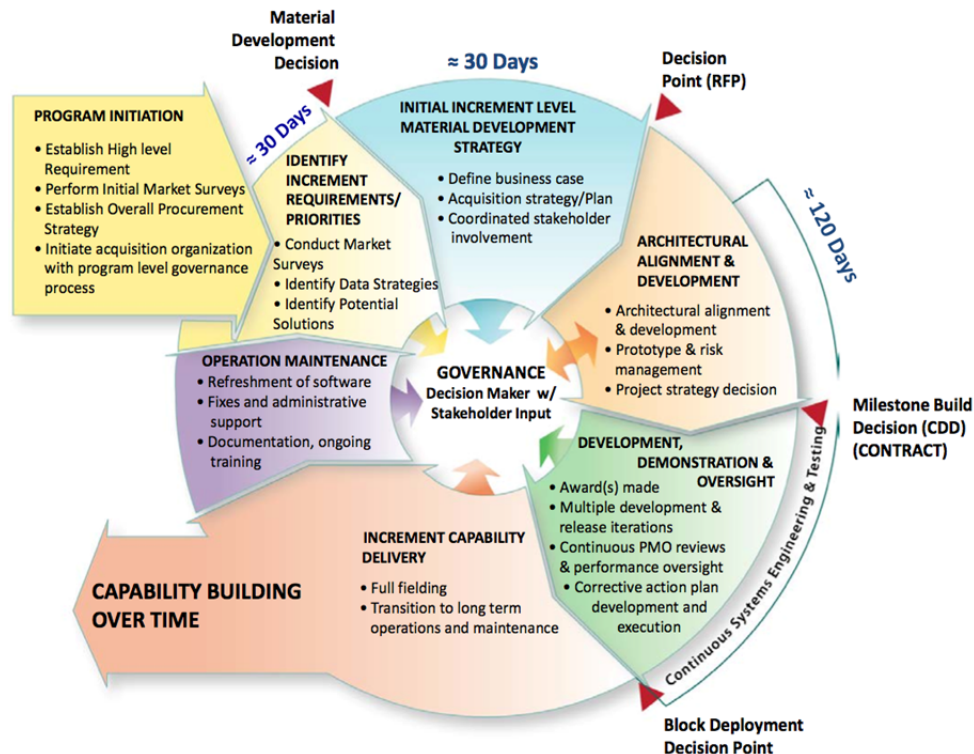


Figure 14. The IT 360 Process (From Gansler & Lucyshyn, 2012).

Gansler and Lucyshyn's IT 360 framework has four primary objectives: 1) provide practical capabilities to the DoD enterprise quickly and efficiently, 2) incorporate commercial management practices to reduce overall risk, 3) grant maximum flexibility to the Milestone Decision Authority (MDA) to reduce the reporting and administrative burden, and 4) respond effectively to the end-users' needs. The IT 360 process removes many of the obstacles that have hindered IT acquisition; however, it will not remove all of the obstacles. Thus, Gansler and Lucyshyn identified several initiatives or actions needing to take place in order to support the IT 360 process and mitigate process shortfalls. These initiatives include document streamlining, flexible contracting mechanisms, and the implementation of forward-looking, technology-neutral standards.

There are many similarities between IT 360 and BCL but there are also clear distinctions. For the acquisition of Defense business systems, each framework features smaller increments, continuous testing, and iterative prototyping to improve performance and increase efficiency in order to deliver capabilities. The differences between the two begin with their developmental process. The IT 360 developmental process is fundamentally different from the BCL process in its phases and approach within each phase. IT 360 appears less cumbersome and more efficient. Also, IT 360 employs a far more superior timeline in producing capabilities as it intends to deliver capabilities within a year while BCL is still within its Investment Management or its Prototyping phase within its first year.

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V. CONCLUSION

A. PERSISTING ISSUES FOR BCL OR ANY NEW IT ACQUISITION SOLUTION

Gansler and Lucyshyn identified a number of challenges and barriers that must be overcome in order for IT 360 to be successful; however, these challenges and barriers are not exclusive to the IT 360 proposal but apply to every other solution proposed including the BCL process. Some of the most persistent challenges to timely IT acquisition include achieving commercial best practices (e.g., contracting practices), spending cuts, funding methods, workforce issues, and the inherent difficulty of implementing change (e.g., a new acquisition process). The barriers to timely IT acquisition consist of laws and regulations that were written by Congress to improve oversight within the Defense Acquisition System but have inadvertently created barriers. Furthermore, these barriers involve issues within research and development reporting, MAIS reporting thresholds, designated DoD authorities, and specified appropriations.

1. Barriers

Research and Development (R&D) reporting continues to require that all R&D funds used for programs be submitted to Congress at the beginning of the program to ensure that funding is accounted for and that oversight is adequate. This process is problematic given the evolutionary nature of BCL, IT 360, and other frameworks that use incremental development. Additionally, acquisition funding remains inflexible and cannot be applied throughout an IT acquisition portfolio.

MAIS reporting thresholds create barriers because unlike non-MAIS programs, these programs are subject to more rigid reporting standards (Gansler & Lucyshyn, 2012). Since Defense business systems often meet MAIS cost thresholds, Defense business systems acquired using IT 360 and similar approaches may be subject to the MAIS reporting process, which can hinder

acquisition because it does not facilitate incremental development (Gansler & Lucyshyn, 2012). Portfolio-level reporting for MAIS Defense business systems should be implemented to resolve this issue.

The designation of authority for all DoD acquisitions remains ambiguous even for the new BCL process. For instance, USD(AT&L) is responsible for the guidance and policy of the new BCL IT acquisition process; however, the DCMO is responsible for its implementation along with the DoD CIO who is responsible for agile, secure, efficient, and effective DoD IT (Porter, 2012). Another example is the authority of investment review boards (IRBs). The IRB's ability to analyze the strength of an IT investments remains separate from the authority of the CIO's responsibility to ensure product integration, which results in more ambiguity in oversight and decision-making authority (Gansler & Lucyshyn, 2012). Essentially, oversight and responsibility may be applied inconsistently and can be detrimental to an IT acquisition program's success.

Lastly, appropriation methods for IT remain problematic. Under any of the proposed incremental developmental approaches, requirements may be added or changed after the budget is completed; however, this flexibility is jeopardized because of the appropriation methods and its requirement that all funds appropriated by Congress must be used only for the programs and purposes for which the appropriation was made (Gansler & Lucyshyn, 2012). This appropriations issue is one part of the overall funding issue that remains to be a challenge and will be discussed further in the next section.

2. Challenges that Remain for Any IT Acquisition Solution

a. Achieving Commercial Best Practices

The commercial industry has enjoyed great success in employing an agile IT acquisition approach. To deliver software and hardware capability more rapidly, the commercial industry has embraced the iterative, incremental development (IID) approach. The IID approach addresses two important issues for IT systems: the need for user interaction in setting requirements and the

complexity of development (NRC, 2010). Key attributes of the commercial IID approach include the prominence of the end-user's involvement, a focus on requirements during early planning, the close integration of developmental and operational testing and evaluation into the development cycle, and the breaking down of projects into increments (NRC, 2010). Additionally, commercial IT market leaders manage IT demands by instituting standardization and discipline at the heart of their respective IT enterprises while enabling agile, customer-led innovation at the edge of these enterprises (NRC, 2010). In fact, most large IT providers have developed highly reliable, available, and scalable computing environments as pillars of their products and services provided.

Many successful commercial IT providers have organized development around two key principles: portfolio management and development by small teams (NRC, 2010). Portfolio management is an effective method when limited resources impact IT acquisition because "limited resources are strategically allocated to a subset of possible projects where project risk, overall objectives, costs, benefits, and project interdependencies are all weighed, and a corporate-level decision is rendered on strategic investments" (NRC, 2010). Lastly, the greatest benefit of commercial industry practices is their timely development of IT products and services. Commercial technology evolution cycles for communications, computers, and software average 18 months (Gilligan et al., 2009). For example, successful commercial practices are seen and utilized in companies such as Apple and Microsoft. These two industry leaders are able to produce products, both hardware and software, in an efficient and timely manner while meeting consumer requirements and demands. Their use of best commercial practices continues to set them up for success.

The DoD desires an acquisition process that is modeled after "successful commercial practices for the rapid acquisition and continuous upgrade and improvement of IT capabilities" (DSB, 2009). Modeling successful commercial practices means that the DoD would be able to deliver meaningful capabilities that meet requirements in a more agile manner over a much shorter

period of time. Successful commercial practices are typically at the leading edge of innovation and technological advancements where DoD needs to take advantage; however, doing so remains a challenge for the DoD. For instance, even where the DoD attempts to adopt commercial practices, government contracting differs significantly from commercial best practices due to regulatory and legislative factors (e.g., fiscal constraints, transparency requirements, and the requirements for audit and oversight) (Gansler & Lucyshyn, 2012). As a result, contracting practices pose a challenge due to the inflexibility found in government contract procedures.

In order for the DoD's business systems to remain current as the pace of change in IT accelerates, greater contract flexibility is required. According to Gansler and Lucyshyn (2012), contracts must be structured to reflect evolving requirements and incremental developments and decisions (Gansler & Lucyshyn, 2012). For instance, program managers need to possess the level of authority to be flexible in order to be able to defer requirements to the next increment when necessary. However, DoD contracting practices generally do not provide program managers with this level of flexibility (Gansler & Lucyshyn, 2012).

b. Acquisition Funding for Incremental Development

A remaining challenge to achieving timely IT acquisition that limits the effectiveness of the BCL, IT 360, and other proposed incremental approaches, are IT acquisition funding procedures. As discussed in Chapter II, the source of the funding problem in IT acquisition is the DoD's Planning, Programming, Budgeting, and Execution (PPBE) system. The PPBE system operates on a timeline that is inconsistent with the fast-paced IT commercial marketplace and offers no flexibility to be able to respond to the rapid changes in IT. For example, after Congress appropriates funding based on programs and appropriations, this allocation scheme becomes problematic when a program is allocated enough funding for development but later requires funding to support

additional testing. Under the current appropriations system, reallocation of funds among phases is impermissible and to exacerbate matters further, the budget component of the PPBE process requires a 3-year lead time (Gansler & Lucyshyn, 2012). Furthermore, IT programs are individually funded by separate appropriations with unique rules and definitions for each. This PPBE funding method continues to be an unresolved issue and will certainly impact any new IT acquisition process, including BCL. According to the DoD's report to Congress in 2010 regarding a new approach for delivering IT capabilities within the DoD, the DoD stated:

In the new IT acquisition approach [BCL], a business case evaluation of alternatives, supported by appropriate BPR, will be conducted, and the materiel solution will be selected just prior to project initiation, ensuring that the latest technologies are considered. However, if the Department uses traditional Planning, Programming, Budgeting and Execution System (PPBE) processes to plan, program, and budget based on the approved business case, there will be a risk of incurring up to a two-year delayed project start. (DoD, 2010)

With this being the case, the incremental processes of BCL, or of any other solution, is vulnerable to the same funding issues that have negatively impacted IT systems acquired using the traditional acquisition system. The prevailing guidance on the DoD's newest approach, found in the DTM, does not address funding methods or this particular funding issue.

The DoD has considered a few alternatives in the past in addressing this funding issue. These alternative approaches to addressing the funding issue include obtaining a single appropriation type for IT projects, establishing an IT revolving fund, and redefining a funding element that more accurately reflects the nature of IT capability investment (DoD, 2010). The alternative of obtaining a single appropriation type for IT projects would provide beneficial funding flexibility for development, procurement, and operations and maintenance and will also permit the funding of a range of potential IT materiel solutions (DoD, 2010). The alternative to establish an IT revolving fund to permit

incremental funding of alternatives to support the entire IT investment would also be beneficial; however, with this alternative, projects will need to be authorized through a series of internal controls (e.g., congressional notification) based on defined dollar thresholds of the planned procurement. Lastly, the alternative of redefining a funding element would provide the DoD with the necessary flexibility to realign funding to proposed projects with sound business cases (DoD, 2010). Of these considerations, obtaining a single appropriation type for IT and redefining a funding element would both be viable options; however, establishing an IT revolving fund with congressional control over the types of projects that can be funded makes this alternative less attractive and more cumbersome and subject to delays due to the congressional bureaucracy. Regardless of the funding alternative selected, the DoD has to request legislative action to change the current PPBE system in order to better facilitate BCL and rapid IT acquisition.

c. Defense Spending Cuts and the Impact on Agile IT Acquisition

Funding issues cannot be discussed without addressing the current Defense spending cuts as it relates to IT acquisition. Chief among the conceptual IT acquisition changes provided by all the proposed solutions and frameworks is the emphasis of an agile or incremental developmental process. The agile developmental process demands quick development of smaller pieces of a potentially larger program or large deliverables broken into constituent units that are then prototyped and tested far more quickly than if the entire program had been built before testing occurred (Porche et al., 2012). Implications of an agile approach and why it remains difficult to achieve relates to the current fiscal environment.

Defense budget cuts will continue to impact the DoD's plan to execute effective IT acquisition. In July 2013, Defense Secretary Chuck Hagel warned the Senate Armed Services Committee that automatic budget cuts have already negatively impacted DoD "severely damaging military readiness" (Philpott, 2013). Hagel went on to say that the Department "would seek to

minimize cuts in the day-to-day operating costs most closely related to training and readiness,” but without relief, Defense spending will take another \$52 billion hit in fiscal year 2014. Readiness is most associated with planning for and acquiring assets for mission needs, which directly relates to all of the DoD’s acquisition activities including personnel. Defense budgets cuts are especially concerning for the agile acquisition concept and new process implementation due to what would be required in regards to funding to make it all possible. If agile IT is desired, then additional people, materials, and money are going to be required to make numerous IT acquisition actions happen along program lifecycles, which includes development, engineering, testing, security, and accreditation among other things. Furthermore, in this day and age of sequestration and shrinking Defense budgets, it is getting increasingly more difficult for the DoD to provide agile IT acquisition when resources are not available. Lastly, the DoD’s current motto is “doing more without more” as been expressed by Frank Kendall in the DoD’s Better Buying Power Memorandum (OUSD[AT&L], 2012). Essentially, this motto means doing more with less, but it appears infeasible to cut cost and attempt to improve a process that requires increasingly more funding. Due to the DoD’s enormous IT appetite, acquisition executives and senior leaders in the Department need to reconcile the dilemma between cutting cost and acquiring IT as rapidly as possible.

There is an axiom in government acquisition regarding cost, schedule, and performance whereby an end user only gets to choose two of these three factors, for example cost and schedule, where the cost is implied to be lower and the schedule is implied to be more timely. However, choosing both cost and schedule will put performance at risk, for if an end user gets the product cheap and fast, it may not be good, according to the axiom. Whether this axiom is true or not, the point here is that the DoD desires agile IT, and to acquire IT systems fast, it will definitely cost more money and the required performance may or may not be available depending on the stage of the incremental

development approach. Thus, funding remains to be a significant issue for BCL and any other framework to be effective and the DoD has to resolve this matter.

d. The Acquisition Workforce and Acquisition Management

One of the most important aspects to achieving effective IT acquisition involves the quality and quantity of the acquisition workforce. Quality equates to the experience, knowledge, and management ability of the workforce. In regard to quantity, the acquisition workforce has been significantly reduced over the past 20 years, which has resulted in a reduction in the DoD's internal technical competencies (Gansler & Lucyshyn, 2012). Furthermore, over 60 percent of the government IT acquisition workforce is older than 45 years of age, and many workers lack the specialized IT skills found in the younger generation (Gansler & Lucyshyn, 2012). Ultimately, the workforce and management issues addressed in Chapter II have not been resolved in their entirety within any of the proposed solutions including the BCL process, for no plan specifically addresses workforce improvements and its alignment with a new acquisition process.

The 2009 DSB task force believed that improvements in four specific areas would ultimately improve the acquisition of IT in DoD: acquisition policies and process, roles and responsibilities of the CIO, milestone decision authority roles and responsibilities, and acquisition leadership and expertise (DSB, 2009). Of these four areas, the acquisition leadership within the workforce is key and more must be done to improve this critical element of IT acquisition. Regardless of any new acquisition concept or theory implemented, it is the people who are the drivers of success and the acquisition process is only an enabler. In other words, a new acquisition process alone will not result in success if matters involving acquisition expertise, leadership, and management (including change management) are not appropriately addressed. Without this crucial element, any new process proposed will potentially meet resistance and failure.

As discussed in Chapter II, workforce problems involve a lack of appropriately trained, educated, and experienced acquisition personnel along

with a bureaucratic and cumbersome acquisition process. Also, stability in leadership, both civilian and military, remains an issue. For example, a 2013 GAO study reported that an Air Force program experienced unstable leadership due to having four different program managers within a 4-year period (GAO, 2013). Additionally, there is a growing concern due to budget cuts, hiring freezes, sequestration, and commercial sector competition that the DoD will not be able to hire and maintain highly qualified and experienced IT acquisition personnel. For example, in a 2013 HASC hearing on IT, General Keith B. Alexander, commander of United States Cyber Command, stated:

The issue is they [the acquisition workforce] have taken a pay cut and now we are saying, “Well, you might get a pay cut again and this pay cut will be furlough and we are not sure how that is going to go, or where that is going to be.” That uncertainty is something that truly complicates their willingness to stay with us [DOD]...these are technically qualified people. You go out to Google, they are looking for people today. You know, I sat down with the Google HR [human relations] folks. They said, “Look, we are paying, you know, probably twice as much as you are paying folks” and they are having trouble getting them. (Information Technology and Cyber Operations, 2013)

Although workforce issues have not been directly addressed in acquisition process improvements, there have been recent initiatives that have systematically addressed workforce concerns. First, former DoD CIO Vivek Kundra’s *25 Point Implementation Plan to Reform Federal Information Technology Management* highlighted the role of the IT acquisition workforce, created focus on IT acquisition specialists, and helped in the creation of a new occupational category termed the “IT Program Manager” (Kundra, 2010). Second, the current DoD CIO, Teresa Takai, who is the IT acquisition workforce Functional Leader (ITFL), is now directly responsible for the IT acquisition workforce and in 2012 she issued the IT Acquisition Workforce Strategic Plan. This plan implements near-term initiatives and plans for longer-term objectives associated with DoD’s IT Acquisition reform movement (Takai, 2012). Specific actions within this plan can be summarized under four guiding strategic goals:

- Create robust, sustainable IT acquisition and IT program management communities.
- Develop a competency model and career roadmaps for IT acquisition and IT program management personnel.
- Sustain learning and growth throughout the professional lifecycle.
- Work across broad stakeholder communities to integrate IT acquisition reforms into IT acquisition curricula. (Takai, 2012)

Since 2012, the ITFL has been engaged in improvement efforts with a preliminary focus on what is considered to be the "ABC's" of improvements: analysis of the existing state of the IT acquisition workforce; building the IT Functional Integrated Process Team (FIPT), and initiating a full-scale competencies review (Takai, 2012). The ITFL improvement efforts are ongoing and are potentially promising. In particular, issues of tenure and rotation of key acquisition personnel are discussed in the plan; however, it does not go as far to set policy or recommend actions as it relates to tenure and rotation.

Although training and education are mentioned in the IT Acquisition Workforce Strategic Plan and are very important to the acquisition workforce, training and education are no substitute for experience in successfully managing acquisition programs of increasing complexity. Thus, acquisition personnel, to including uniformed personnel in certain capacities within the acquisition workforce, need a robust process of assigning and sustaining these key positions for the long term. This strategic plan strengthens and broadens those initiatives, but it falls short in resolving program instability and maintaining an experienced acquisition workforce. Also, the plan fails to provide change management direction for the workforce. Along with experience and good management, there needs to be change management initiative.

e. Organizational Change Management

One final aspect of IT acquisition reform as it relates to a new acquisition process and the workforce involves organizational change management. No plan or solution proposed discussed a change management process or how the DoD will go about executing transformation to implement a new IT acquisition process. Change management is of such great importance that if not done successfully it is highly likely that the result will be a failure to implement the necessary changes in order to affect timely IT acquisition. As it relates to the acquisition process and the workforce, there needs to be an imperative to implement a change management plan that would facilitate the implementation of any new acquisition process as well as IT workforce change initiatives found in the workforce strategic plan.

Given the size and complexity of the DoD, accomplishing change can be a very difficult undertaking, which is why effective change management is necessary. One of the most difficult aspects of change in implementing a new acquisition process is changing the culture because the workforce has become very accustomed to using the ineffective but well understood traditional acquisition system (Gilligan et al., 2009). In *Leading Change: Why Transformation Efforts Fail*, John P. Kotter (1996) postulated what he considered to be the primary reasons why change efforts fail. Kotter offered eight reasons why this failure occurs:

- Not establishing a great enough sense of urgency
- Not creating a powerful enough guiding coalition
- Lacking a vision
- Under communicating the vision by a factor of ten
- Not removing obstacles to the new vision
- Not systematically planning for and creating short-term wins
- Declaring victory too soon
- Not anchoring changes in the corporation's culture (Kotter, 1996)

Of these eight reasons, the DoD has fallen short in at least two areas: not removing obstacles to the new vision (e.g., removing funding issues) and not anchoring change in the corporation's culture or, in the DoD's case, the organization's culture. In regard to culture change, and closely related to Kotter's postulates, there is the seminal work of Edgar H. Schein in his 1992 publication *Organizational Culture and Leadership*. In reference to organizational culture, Schein (1992) emphasized that behavioral or culture change is important to successful transformation (Schein, 1992). As described by the National Research Council (NRC) in *Achieving Effective Acquisition of Information Technology in the Department of Defense*:

Cultural aspects of the DOD acquisition process that have an impact on the potential success of IT acquisition efforts include the following: the bias that larger is better, the sense that oversight personnel have no accountability for delaying needed IT capabilities, an emphasis on process risk (executing the acquisition process correctly) rather than on the risk of late delivery of end-user capability, an unwillingness to admit program failure, an emphasis on process over product, a belief that the DOD is genuinely unique, and the belief that what is good for large weapons systems should be good enough for IT systems. (NRC, 2010)

It is clear that a culture change is necessary to usher in the sort of wide-ranging changes proposed by any new acquisition process. Both Kotter's and Schein's works provide a framework for assessing whether the DoD's current IT acquisition reforms will be successful and by all accounts at this point, success is uncertain. To provide more certainty, effective acquisition leadership and management to include change management is absolutely essential. According to Allen and Eide (2012), "the prognosis for effective reform is dim without embedding leadership actions and institutional processes that will drive change in the culture of Defense acquisition. Without such intentionality, one can expect to repeat the history of unfulfilled mandates for reform" (Allen & Eide, 2012).

B. SUMMARY, FINDINGS, RECOMMENDATIONS, AND FUTURE WORK

1. Summary

Information technology (IT) has become ubiquitous and absolutely essential to the DoD and to United States national defense. Concepts and strategies such as network-centric operations, information superiority or dominance, and cyber security are integral to the DoD's ability to conduct warfare in the twenty-first century. Furthermore, the DoD's reliance on IT will only increase in the coming years and will continue to be driven by innovation and technological advancements. For these reasons, it is important for the DoD to resolve its IT acquisition issues.

The traditional Defense acquisition system has failed in meeting IT goals in producing new technologies that conform to desired cost, schedule, and performance parameters. This study focused on the timeliness or scheduling portion of the IT acquisition process, although cost and performance are important factors that are influenced by schedule. Many government reports, congressional documents, academic papers, and other writings have concluded that the traditional acquisition process is ill-suited to efficiently deliver IT systems in a timely manner. This literature cited numerous IT acquisition deficiencies with regard to process, system or product development, workforce, and management of IT projects. Currently, improvements to the IT acquisition process are being made as part of an ongoing revision to DoD's 5000 series acquisition directives and the implementation of the BCL framework for Defense business systems.

With the initiation of the BCL framework in June 2011, the DoD has articulated its commitment to improving the acquisition process; however, implementation of BCL has been slow and uneventful thus far. Also, it is too early to determine if this latest reform effort will yield significant improvements in the speed and effectiveness of IT acquisition. Ultimately, the BCL effort may join a long line of acquisition reform efforts that have taken place over the past three decades in which many of these reform efforts have lead to even more reform.

This may occur because the BCL framework contains shortfalls and problems that will require further reform or tailoring. Although the BCL framework has potential benefits and confidence is high that it is the long-awaited solution to the DoD's acquisition concerns, there is no data that can ensure optimism going forward. However, data does exist that suggests BCL, as well as any other proposed IT acquisition strategy, will continue to face problems. For instance, the BCL process maintains similarities to the traditional system in terms of process. Also, the process can take up to 5 years to develop an IT system to initial operating capability (IOC), which is a long time for an IT project to reach this point as compared to the commercial industry.

Although the BCL process has replaced the traditional acquisition system for Defense business systems, there is much more work to be done due to lingering issues carried over from the traditional acquisition system. These issues involve achieving commercial industry best practices, which is a challenge given the DoD's bureaucracy, regulatory procedures and statutes. Also, the IT acquisition funding process is not aligned to support agile acquisition methods and potential Defense spending cuts will only exacerbate this issue. Most importantly, the acquisition workforce and management of the acquisition process (e.g., MAIS reporting thresholds, designated DoD authorities, and change management efforts) need to be further addressed. The next two sections present a list of findings and recommendations based on this study.

2. Findings

- Finding 1: Different IT acquisitions (i.e., hardware or software) have inherently different acquisition process needs and thus necessitate different approaches or strategies to better accommodate timely acquisition. Essentially, the BCL framework may run the risk of going back to the one-size-fits-all approach if different processes or templates are not designated.

- Finding 2: Challenges and barriers to timely IT acquisition remain, which include achieving commercial best practices, Defense spending cuts, IT funding methods, and workforce and management issues. Barriers to the implementation of a new acquisition process involve issues within research and development reporting, MAIS reporting thresholds, designated DoD authorities, and specified appropriations.
- Finding 3: The BCL framework has shortfalls, inherent weaknesses, and potential problems involving its similarities to the traditional acquisition process, limited applicability, and process timelines.
- Finding 4: Funding processes remain a root issue for BCL that will limit its effectiveness. Also, there exists a dilemma between cutting cost and acquiring IT systems through agile means. No proposed solution, (i.e., BCL or IT 360) will be unaffected by shrinking Defense budgets and the DoD concept of “doing more without more.”
- Finding 5: The DoD is likely to experience problems in full-scale implementation of the BCL process with its planned shorter durations and agile intent due to cultural comfort with IT projects taking multiple years along with the common practice of thorough implementation of DoD 5000 process steps. Essentially, these steps can negatively influence acquisition programs and cause them to lean towards larger increments and less timely delivery.
- Finding 6: IT acquisition contracting procedures are not aligned with the objective of 12-month incremental deliveries, as outlined by BCL guidance and thus can serve to increase timelines.

3. Recommendations

- Recommendation 1: As was suggested in the BCL implementation guidance, tailoring of the BCL framework is welcomed. Due to shortfalls and potential problems identified within the BCL framework, tailoring should account for the different strategies needed to address the different needs of both hardware and software development projects which can potentially serve to expedite the IT acquisition process. Aspects of IT 360, along with the concepts of process templates and shorter timelines from other process models or frameworks, should be incorporated into BCL.

- Recommendation 2: The DoD must submit to Congress a proposal for changes to be made to the PPBE funding mechanism to make the IT funding process more flexible and adaptable to meet the requirements of different IT acquisition programs. Furthermore, it is recommended that IT funding be aligned to meeting portfolio management efforts or allocated to mission areas rather than specific programs. Essentially, more stable funding to ensure efficiency and sustainability is highly recommended.
- Recommendation 3: The DoD recently established annual reporting on Defense Acquisition (e.g., programs, institutions, workforce, managers, executives, and industrial partners) with its first report released in June 2013, which focused primarily on performance related to Major Defense Acquisition Programs (MDAP). Due to the need of progress data or measures of effectiveness on the BCL acquisition process, it is recommended that the next DoD annual report on the performance of the Defense acquisition system focus exclusively on the BCL process. This data and analysis could then be used to measure performance to inform future decisions on programs, policies, processes, or recommend further tailoring.
- Recommendation 4: Along the same lines as Recommendation 3 in regard to assessment, it is recommended that the DoD evaluate appropriate metrics for BCL progress reporting in an effort to fine-tune the process using lessons learned from the initial implementations.
- Recommendation 5: It is recommended that DoD programs that require rapid acquisition, particularly those involved with cyber security, work to ensure stable sources of funding. In the interim, it is recommended that the DoD explore all available funding options to include rapid contracting options.
- Recommendation 6: Because agile acquisition reflects such a significant departure from past IT acquisition processes, it is recommended that training of both government and industry personnel be given a higher priority with an emphasis on culture and organizational change for government employees. Additionally, it is recommended that a change management plan be executed simultaneously with BCL implementation and that this plan be incorporated in the updated version of DoDI 5000.02.

- Recommendation 7: Effective IT acquisition process implementation management, change management, and overall acquisition system management are key. Therefore, it is recommended that the DoD focus on the IT acquisition workforce and its management of the IT acquisition system.
- Recommendation 8: It is recommended that the DoD mandate fielding of IT projects at the same pace or near same pace as the commercial industry with a penalty of project cancellation to provide the incentive to overcome resistance to change and other problems. This mandate can also serve to align other critical processes (i.e. oversight, development, testing, and contracting) in order to ensure that they function on the same expedited timeline.
- Recommendation 9: Given all the IT acquisition change proposals over the past several years, it is recommended that the DoD focus its efforts on the barriers and challenges to any new process tailored for IT acquisition and prioritize reform efforts to quickly implement changes. In particular, it is recommended that the DoD initially focuses on three actions: 1) the mandate that IT projects deliver usable capability in durations—shorter than what is proposed in BCL (i.e., 6 to 12 months); 2) submit funding change proposals to Congress and, in the interim, the DoD should adapt contracting processes to make them more agile; and 3) incorporate acquisition templates into the BCL framework in order to expedite the process.

4. Future Work

Future work and research within the area of IT acquisition should consist of the following activities:

- Conduct an assessment of the feasibility to tailor the BCL framework to incorporate process templates to account for different types of IT acquisition processes
- Adapt BCL to meet the needs of all IT acquisition programs (e.g., National Security Systems, and Warfighting Systems), not just Defense business systems
- Develop a change management plan for the new acquisition process

- Conduct an analysis of the programs currently using the BCL framework to gain insights into the underlying effects of BCL process; doing so will inform better policy and programmatic decisions.

C. CONCLUSION

As the DoD continues its efforts at transformation of its military forces and Defense business systems in order to meet the various challenges of twenty-first century warfare, it will increasingly rely on IT systems, despite budget cuts. Thus, DoD will need to resolve its IT acquisition issues in order to provide systems in a timely manner that meet requirements and are within budget. The DoD has introduced a number of initiatives in the last decade in an effort to improve IT acquisition; however, problems remain. BCL, despite having many potential benefits, does not go far enough to address the underlying conditions and obstacles discussed throughout this study. Improvements to requirements gathering and oversight have seemingly been addressed in the BCL framework although issues involving the acquisition workforce, acquisition management (i.e. change management), and allocation of funding continue to persist. Most importantly, how can any program succeed that can take up to 5 years to complete? With an 18-month technology change cycle in the commercial sector, lengths of time such as this significantly reduce the potential for the successful implementation of an information system that will meet end-user requirements.

Despite the current implementation of a comprehensive restructuring of DoD IT acquisition, the process is not entirely fixed. Given the current DoD budgetary environment and the increased pressure to reduce Defense spending, the DoD must find a way to continue to improve the efficiency with which it develops, acquires, and fields IT systems. There is no silver bullet to fixing IT acquisition, as the proposed recommendations within this study are only ideas; however, effective management up and down the chain has to be a focal point. Acquisition personnel, both civilian and uniform, are the drivers of success; the acquisition process is only an enabler but the process has to be accommodating

to timely acquisition. Addressing funding impediments, installing effective acquisition management, and incorporating aspects from other frameworks (e.g., templates and associated timelines) into the BCL framework along with an organizational change management plan, can have a positive impact on the speed and effectiveness of IT acquisition within the DoD.

There is no claim that all the findings and recommendations presented here are entirely new ideas; however, they provide new focus in addressing this matter. The bottom line is that the inability to effectively acquire IT systems in a timely manner is detrimental to national defense. These problems must be overcome because IT is critical to DoD's capabilities for they provide command and control, decision support, and overall situational awareness. The challenges surrounding IT acquisition must be addressed systematically in order to improve the acquisition process. As mentioned in the Defense Science Board 2009 report, "without an acquisition process that accommodates, and takes advantage of, IT's rapid pace of change, future DoD acquisition officials will likely be frustrated in their efforts to equip the nation's warfighters and weapons systems with the needed information technologies" (DSB, 2009). DoD needs to focus its efforts by mandating that IT projects deliver usable capability in shorter durations (e.g., 6–12 months) by modifying the BCL process to include acquisition templates and their associated timelines; fixing the funding process to make it more agile; and improving acquisition workforce and overall acquisition management. Doing so, will increase the DoD's likelihood of delivering IT capabilities expeditiously.

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