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NAVY AND MARINE CORPS IT/IS ACQUISITION: A WAY FORWARD

by

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Currently, a disconnect exists between procurement speed and final delivery of capabilities that require IT/IS solutions. Schedules for delivering these capabilities have remained a cumbersome and lengthy hindrance. War-fighting capabilities are consistently degraded as time-dependent requirements are outpaced by new technology before delivery.

To determine the current impediments within the IT/IS procurement process, we limit our examination to the IT/IS decision-making processes, policies, and organizational structures that may be affecting the timely delivery of IT/IS systems. For the purpose of this thesis, the term governance encompasses these focus areas. Though we discuss aspects of the acquisition process and its guiding policies, a full analysis of the process remains outside the scope of this thesis. Instead, we chose to focus on how governance is affecting the timely delivery of IT/IS capabilities to the warfighter.

A timeline analysis of relevant defense program cases forms the basis of our assessment of IT/IS governance. The aim of this thesis is to right-size the governance, or authority therein, required to effectively deliver IT/IS solutions to the war-fighter. We conclude with findings and recommendations as well as further research into adjusting responsibilities and authorities for IT agencies and acquisition professionals.

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LIST OF ACRONYMS AND ABBREVIATIONS

AMF	airborne and maritime/fixed station
ANW2	adaptive networking wideband waveform
AoA	analysis of alternatives
API	application programming interface
AWF	acquisition workforce
BBP	better buying power
BCL	business capability life cycle
C4	Command and Control, Communications, and Computers Directorate
CANES	Consolidated Afloat Networks and Enterprise Services
CD&I	combat development & integration
CIO	chief information officer
COTS	commercial-off-the-shelf
CSIS	Center for Strategic and International Studies
DAMIR	Defense Acquisition Management Information Retrieval
DAS	Defense Acquisition System
DAU	Defense Acquisition University
DAVE	Defense Acquisition Visibility Environment
DCOI	Data Center Optimization Initiative
DISA	Defense Information Systems Agency
DOD	Department of Defense
DON	Department of the Navy
DSB	Defense Science Board
DWCF	Defense Working Capital Fund
FAR	Federal Acquisition Regulation
FITARA	Federal Information Technology Acquisition Reform Act
FOC	full operational capability
GAO	Government Accountability Office
GMR	ground mobile radios
I&IMP	Interoperability and Integration Management Plan

IaaS	infrastructure as a service
IDA	Institute for Defense Analyses
IS	information system
ISNS	Integrated Shipboard Network Systems
IT	information technology
ITMRA	Information Technology Management Reform Act
ITPR	information technology procurement request
ITPRAS	information technology procurement request/review and approval system
ITSM	Information Technology Service Management
JCIDS	Joint Capabilities and Integration Development System
JIE	Joint Information Environment
JTRS	Joint Tactical Radio System
LAN	local area network
MACO	Maritime Accelerated Capabilities Office
MARCORPSYSCOM	Marine Corps Systems Command
MARFORCYBER	Marine Forces Cyber Command
MAIS	Major Acquisition Information Systems
MCCOG	Marine Corps Cyber Operations Group
MCEN	Marine Corps Enterprise Network
MCICOM	Marine Corps Installations Command
MCIENT	Marine Corps Information Enterprise Strategy
MDAP	Major Defense Acquisition Programs
MIDS	Multifunctional Information Distribution System
MILCON	military construction
MILPERS	military personnel
MILSATCOM	military satellite communications
MITSC	Marine Corps Information Technology Support Centers
MUOS	Mobile User Objective System
NAVFAC	Naval Facilities Engineering Command
NED	Network Enterprise Domain
NGEN	Next Generation Enterprise Network

NTE	not-to-exceed
NTN	Navy Tactical Network
NDAA	National Defense Authorization Act
O&M	operations and maintenance
O&S	operations and support
OCO	Overseas Contingency Operations
OMB	Office of Management and Budget
PaaS	platform as a service
PM	program manager
PMO	program management office
PPBE	Planning, Programming, Budgeting, and Execution
PPBS	Planning Programming and Budgeting System
R&D	research and development
RCO	rapid capabilities office
SAR	selected acquisition report
SCA	Software Communications Architecture
SCI	sensitive compartmented information
SRE	Site Reliability Engineering
UHF	ultra-high frequency
UNP	universal needs process
UNS	universal needs statement
USCYBERCOM	United States Cyber Command
USD AT&L	Under Secretary of Defense for Acquisition, Technology and Logistics
USG	United States Government
USMC	United States Marine Corps
USN	United States Navy
WCDMA	wideband code division access

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I. INTRODUCTION

Since the 1960s, the U.S. government (USG) has been attempting to corral the federal acquisition process and the many businesses and personnel working within it. Focusing on the Department of Defense (DOD) budget, this attempt at continual reform has come in the form of the National Defense Authorization Act (NDAA) each fiscal year. The NDAA authorizes and directs federal spending on manning and equipping the nation's military services. In short, it establishes funding for every aspect of military and defense related affairs. The effort applied to acquisition reform through the 70s and 80s orbited around reoccurring issues, changing with regularity as the pendulum swung from administration to administration.

With the introduction of the World Wide Web and advancements being pursued in information technology and systems (IT/IS) in the early 1990s, Congress passed the Clinger-Cohen Act of 1996. Formerly known as the Information Technology Management Reform Act (ITMRA), it officially established federal Chief Information Officers (CIOs) and sought to clarify their roles and responsibilities. In addition, it developed methods streamlining federal IT acquisition processes by forcing federal agencies to focus on IT investment portfolios (Department of Defense [DOD], 2017). This was the USG's first attempt at reforming IT acquisition.

With the introduction of a new millennium, the application opportunities within the realm of IT moved to the forefront of the private and public sectors. This shift led to major changes within the national security strategy, the largest being the establishment of the U.S. Cyber Command (USCYBERCOM) in 2009. This marked the official recognition, by the USG, of the cyber war-fighting domain. In the years since, numerous cyber events have made it to the mainstream of public awareness. Due to the prominence and elevation of cyber as a significant national security threat, requirements increased for equipment to execute its mission. As with any major defense asset, IT/IS life cycle management is robust and complex and thus the traditional process for procurement and fielding of IT/IS equipment remains similar to other war-fighting systems. A 2009 report submitted to the Under Secretary of Defense for Acquisition, Technology and Logistics

(USD AT&L) from the Defense Science Board (DSB) concluded that, "the conventional DOD acquisition process is too long and too cumbersome to fit the needs of the many IT systems that require continuous changes and upgrades" (Under Secretary of Defense for Acquisition, Technology and Logistics [USD AT&L], 2012, p. 5).

Today, despite the findings of the DSB report, little has changed within the IT/IS procurement process as validated through a 2012 Rand Corporation study and multiple subsequent Government Accountability Office (GAO) reports (Porche et al., 2012; GAO 2016a, 2016b). Of note, within the Department of the Navy (DON), cited issues are consistent with the 2009 DSB report (Porche et al., 2012). In 2014, in an effort to address these findings as part of the FY15 NDAA, Congress passed the Federal Information Technology Acquisition Reform Act (FITARA). More specifically, the FITARA aimed to further establish federal IT spending accountability and expand the roles and responsibilities of federal CIOs. In regard to the implementation of FITARA, a GAO report from December 2016 concluded that the federal government had complied with only 46% of IT reform recommendations prescribed under the new act. The report (Government Accountability Office [GAO], 2016b) explicitly drew attention to The Office of Management and Budget's (OMB) Data Center Optimization Initiative (DCOI) projected savings of $8.2 billion to be realized by 2019. The report uncovered that since the program's inception in 2010, the DOD has saved only $293 million of the total $4.8 billion thus far saved by the USG. It also reported that the USG was set to spend $89 billion on IT in FY17 with the DOD estimate to account for 41% of this figure (GAO, 2016b).

While the DOD has yet to implement many of the reform agenda items illustrated by the 2016b GAO report, as of April 2017 it has also struggled to implement most if not all of the recommendations made in the 2009 DSB report (Carberry, 2017). As a result, the execution of current IT efforts, such as the Joint Information Environment (JIE) and DCOI, has performed consistent with DSB findings. Timely delivery of capabilities to users, or in this case the warfighter, has suffered as a consequence. Thus, the emphasis of this thesis is to research possible approaches for modifying trends in the current delivery of IT/IS systems. The overall objective is the identification of unnecessary obstacles and

barriers to more effective and efficient governance with regard to IT/IS management and acquisitions within the DON.

A. PROBLEM STATEMENT

A disconnect exists between timely delivery of IT/IS capabilities and warfighter requirements. This disconnect is perceived as gaps between operational needs, time dependencies, and associated costs in equipment programs, resulting in degraded war-fighting capability. A root cause analysis of this gap suggests that the management and governance of IT/IS systems are contributors to the timely delivery of IT/IS systems. Consequently, the problem we seek to explore is why there seems to be a gap between the expected operational need and the delivery of capable IT/IS systems in the Navy and Marine Corps.

B. SCOPE AND LIMITATIONS

The scope of this research examines the governance of the Department of the Navy's (DON) IT framework encompassing the following areas: the decision-making process and authorities therein, federal law and service component policies, and IT/IS related organizational structures. In this examination, IT/IS will be defined as any equipment, infrastructure, or system used to store or process information in order to support and defend the Navy and Marine Corps networks. In an attempt to identify specific recommendations to reduce the cycle times associated with IT/IS procurements, we will assess how current governance of the United States Navy (USN) and the United States Marine Corps (USMC) IT/IS systems is affecting the timely delivery of IT/IS solutions.

While we will examine elements of the defense acquisition process, the scope of this research is limited in that it does not fully examine the acquisition process in its entirety. In addition, the number of major automated information systems (MAIS) assessed in support of our claim is limited to three programs. This is as a result of limited available programmatic data as well as the time constraints associated with the analysis of data currently available.

C. METHODOLOGY

We examine the governance of USN and USMC IT/IS systems by targeting specific MAIS acquisition programs to illustrate our findings. In doing so, we utilize selected acquisition reports (SAR) retrieved from the Defense Acquisition Visibility Environment (DAVE) or Defense Acquisition Management Information Retrieval (DAMIR) systems. We will recommend that the current governance of IT/IS systems require tailoring or modification in support of future procurements. Our intent is to evaluate and identify initiatives and approaches to conduct more timely delivery of capabilities within IT/IS.

As discussed, this report focuses on three important subcategories of governance within the DOD. The first category is decision-making process flows. Decision-making process flows must align at many levels, including the authorities of the CIOs, program managers (PMs), and lower organizational managers, to ensure the timely delivery of IT/IS solutions. For the purpose of this research, we define effective decision-making as having and exercising the appropriate authorities to manage and coordinate the acquisition of IT/IS systems. The next category is laws and DOD/DON policies. We further examine current IT/IS related federal laws and external/internal policies that may be further hindering timely delivery. The last category is organizational structure. We examine how disorganization within DON organizations affects timely delivery of IT/IS acquisition solutions. Emphasis is placed on ownership and accountability, and the authorities given and exercised to manage the IT portfolio.

Each subcategory chosen illustrates how governance can affect the IT acquisition business currently being conducted, and under what constraints it must abide. Of note, one limitation to each subcategory in this analysis is that each is not an exhaustive analysis.

D. THESIS

Ineffective IT/IS governance is causing failures in timely delivery of the required IT/IS capabilities to the warfighter.

E. SUMMARY

This introduction chapter provides an understanding of our research objectives and the methodology used in conducting said research. By assessing programmatic data, we endeavor to discern the specific functions that require improvement within the governance of DON IT/IS systems. Ultimately, without improvements program managers will remain unable to deliver capabilities effectively and efficiently to the war-fighting user base. Congress has implemented continuous reform, but 22 years after its first tangible IT reform act, the perception is that little has changed. Since 1996, technology has developed at an exponential pace and yet reform discussions still encompass the same corrective measures. We explore the underlying reason for this and recommend how to appropriately align the governance of IT/IS programs with the pace of technology.

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II. LITERATURE REVIEW

> This isn't a broken system that needs radical overhaul. It does need to be improved, and it can be. I believe, and the data support, that we have made significant improvements over the past several years, but there is more work to be done. We do have too much bureaucracy, and we do need to tailor and streamline our programs more. (Kendall, 2017, p. 206)

In our exploration of issues currently affecting IT/IS acquisition schedules for delivering required capabilities, we turned to literature focusing on issues cited that contribute to schedule overruns. To discern possible barriers and the solutions therein to the timely delivery of IT/IS systems, we looked to cycle times to quantify schedule expectations, inclusion of commercial-off-the-shelf equipment and systems, funding execution, the advent of tailoring programs and the associated challenges, and last, the composition and training of the acquisition workforce.

A DOD acquisition program manager (PM) is charged with a delicate balance in the management of cost, schedule, and performance of a given program. In DOD cost estimation, this balance or trade-off is known as the performance, dollars, and time criterion. This criterion suggests that each metric maintains a positive or negative value and that no greater than two metrics can share a positive value at any given time. The basic principle being that no program sustains positive results in all three metrics (Mislick & Nussbaum, 2015). If cost and schedule are both reduced (lower cost and a quicker timeline would hold positive values), then performance will likely suffer as a consequence. Investing taxpayer dollars for an item that simply does not perform to the expected requirements could be seen as a waste of taxpayer dollars. In this regard, most, if not all Major Defense Acquisition Programs (MDAPs) concentrate on performance of the end state capability as the main criteria of a program to ensure its maximum return on investment. Therefore, MDAPs focus on the performance of a system at a reasonable cost in relation to the system's overall functional requirements.

A. CYCLE TIME

While the performance and cost metrics of programs have received considerable attention in the last 30 or so years, it was not until 2014 that timely delivery of programs became such a buzz-worthy topic (Tate, 2016). Technology is moving forward at an alarming rate, heavily influencing current and future procurement challenges. With the influx of rapidly evolving technology, attention in defense acquisitions is quickly escalating efforts in reducing the overall time taken to develop, procure and deliver new systems or convert existing systems. The business world calls this overall timeline "cycle time." Cycle time is defined as the time between the beginning and end of the process of making a product ("Cycle Time," n.d.) or, in our context, the time expended for the life cycle of a given program.

The idea of cycle time within an IT/IS solution may also be viewed through a different lens. The life cycle of IT/IS will likely have a period of usefulness before it is rendered obsolete. The capability may be able to serve its immediate purpose, but due to rapid innovation, its capability may ultimately fall short of prolonged user expectations. This viewpoint may change the overall perceived cycle time of the solution. David Tate (2016) questions whether the amount of cycle time is actually increasing in defense acquisitions or is it simply commensurate with current production capacity. Through his research of MDAP programmatic cycle time data, he suggests that average cycle time, over the last 25 years, is in fact not increasing. This data suggests that the schedule, on its own, is not the sole reason for delayed delivery times.

A major concern throughout the literature reviewed, is the amount of attention given to the acquisition community's inability to keep up with technological advancement rates. Congress has been highly critical of the process. Senator John McCain, in his preamble during the 2017 Secretary of Defense confirmation hearing (Senate Armed Services Committee, Office of Chairman, U.S. Senator John McCain [SASC], 2017), specifically illustrated: "Defense Acquisition still takes too long, and costs too much to deliver too little." Some would even argue further that the DOD acquisition process remains a broken system (Davenport, 2016). Though this issue resides at a higher level than the PMO, it is relevant to the understanding that the problem

within the community of dealing with technological advancements exists early on in the process. Davenport (2016) detailed the current process as so cumbersome that working with cognitive computing resources could help businesses and the acquisitions community reduces their workload in regard to the abundance of paperwork required for reporting and coordination.

Certainly, arguments can be made supporting the theory of mismanaged program schedules. The F-35 program for example, developed a prolonged schedule due to numerous cost overruns associated with various aspects of the program (Bender, 2015). The issues the program experienced presented a plethora of challenges for even the most adept program manager. However, explanations do exist for the F-35's programmatic delays that are commensurate with Tate's (2016) analysis in that the F-35 is an anomaly or outlier when it comes to the schedule and cost overruns associated. In regard to IT/IS involvement, virtually every mechanical part of the F-35 program included some element of software integration (Tate, 2016). This program reflects the fact that if unrealistic expectations exist within major IT/IS integration these expectations will be no better than the cycle time of the program in question.

B. COMMERCIAL–OFF–THE–SHELF USAGE

As programs today and in the future will undoubtedly involve the integration of technology, PMOs continue to look for avenues in mitigating prolonged timelines. Kendall (2017) suggests that schedule slippage may stem from issues within software integration or other overarching process improvements required within IT/IS management. A great deal of discussion, both in and outside of the DOD has revolved around utilizing commercial-off-the-shelf technologies to expedite or tailor the acquisition process. As a subset of U.S. Code Title 41, The Federal Acquisition Regulation (FAR) (2017) specifically states in Chapter 12, Subpart 12.101, that agencies shall utilize commercial or non-developmental items in procurement whenever feasible. Riposo, McKernan, and Kaihoi. (2014) made significant recommendations in methods to reduce cycle times including the use and re-use of mature technologies in both new and existing programs. This report validated current program procedures, as PMO's attempt

to mitigate risk in programs through the use of mature technologies to not only cut costs during development, but to attempt to expedite schedules.

Based on one case study introduced in the next chapter, COTS alone may not be the sole factor in resolving cycle time issues. The Navy's Consolidated Afloat Networks and Enterprise Services (CANES) program is being executed as a COTS-dependent hardware and software-based program delivering little to no significant reduction in overall cycle time. On the contrary, although the program maintains a relatively steadfast schedule, the expectation is that it will experience schedule overruns. This is due to the implementation of commercial technologies coupled with technological advancements. These technologies are being introduced to the information systems currently utilized throughout the fleet and are expected to outpace CANES installations (Badua & Warr, 2014). In addition, a prolonged schedule may also become evident based on the operational tempo associated to the ships. This is in concert with the overall planning and execution efforts imbedded in the program's life cycle.

C. FUNDING LINES

Started under Secretary McNamara in the 1960s as the Planning Programming and Budgeting System (PPBS), the Planning, Programming, Budgeting, and Execution (PPBE) process revolutionized the manner in which the DOD conducted its expenditure process (Fox & Allen, 2011). PPBE has allowed for a significant mechanism for the department to not only project out its fiscal year spending but also how it allocates that spending based on "resource allocation" (Defense Acquisition Portal, n.d.a). As Riposo et al. (2014) illustrate, consternation surrounding cost and schedule overruns has been associated with the stability of funding. The PPBE allows for a planning factor and without it, the DOD would likely have greater cause for concern in regard to the acquisition process. The PPBE process allows for the planning of programs and the associated technologies to be paid for not in full, but over the course of a program's life cycle. Though the process occurs prior to the PMO receiving program funding, the understanding of organizing appropriations categories into specific functions or "colors of money" holds relevance in this review. The PPBE cycle allows for greater oversight

and transparency of funding allocations and eventual expenditures as funding lines can only be expended for their expected purpose (i.e., procurement, research and development [R&D], operations and maintenance [O&M]).

This research in regard to funding is concentrated at the stage when a program/project has received a Milestone B decision in the acquisition process as this officially starts a program with an allocated funding line. This certifies that necessary functional requirements gathering and an analysis of alternatives (AoA) were successfully accomplished, in turn developing a comprehensive cost and schedule plan for the life cycle of the program (Department of Defense Instruction [DODI], 2017). In order to secure funding for future years, the PMO for a specific program must expend funds in the current fiscal year. This, in turn, elicits annual vetting for the program in order to secure future funds based on its performance in properly delivering the requested capability (DODI, 2017). The misconception that funds return to the Treasury if not expended is incorrect. Funds never technically leave the Treasury unless they are executed, regardless of the actual appropriation (Candreva, 2017). Though the PMO is awarded funding to move forward with the program that year, a level of uncertainty looms over the program regarding future year's appropriations, as funding is not guaranteed beyond the current year. This process could potentially cause certain programs to be terminated due to future funding availability during times of fiscal constraint leading to re-assessments of program priorities.

Though stability of funding is certainly an issue at the programmatic level, it may be one that is otherwise uncontrollable in the current acquisition and appropriation framework. Eckstein (2017) states that opportunities exist to secure lines of funding allowing for more spending flexibility within a current fiscal year. These funds, though adding flexibility, would still be tied to the PPBE cycle for program appropriations and issued to the PMO with an obligation rate. This obligation rate represents a programmed rate of expenditure during the respective fiscal year of the program regarding orders placed, contracts awarded, services received, and similar transactions that will require payment during the same, or a future, period (FMR, 2015). Though it can be heavily contested from a higher authority, this is an area in which improvements in

PMO decision-making authority may lead to flexibility in funding execution for their respective programs.

D. TAILORING

As Kendall (2017) suggests, the idea of tailoring programs to facilitate the overall acquisition process has also been widely discussed. Acquisition based reform legislature introduced by Representative Thornberry targeted this approach (H.R. 2511, 2017). In the component services, the idea of tailoring has manifested into 'Rapid Acquisition' efforts. In 2016, following both the Air Force (2003) and Army (2016), the DON established the Maritime Accelerated Capabilities Office (MACO) in conjunction with the Marine Corps' establishment of a Rapid Capabilities Office (RCO). Thus, far, based on numerous interviews with senior level USMC agencies, these efforts have been focused on adding flexibility to the overall process, but have not yet come to full fruition in the rapid development of new or existing programs.

In addition to rapid acquisition, additional tailoring efforts such as contract specific tailoring or incremental fielding have been discussed and implemented. As the 2014 Rand report further suggests, "caution needs to be exercised when applying these strategies because they do not work necessarily for all programs" (Riposo et al., 2014, p. 36). In some cases, tailoring may offer greater potential for cost or schedule overruns in a program that is using new technologies, as the PMO must create a new roadmap for navigating through the process. Thus, a separate system for IT/IS acquisition has been suggested for development and implementation based on the current rate of technological advancements. This is supported by the USD AT&L report (2009) performed by the Defense Science Board (DSB), recommending a new IT/IS acquisition system vice additional process changes. This is based on the challenge of utilizing tailoring in delivering a significant reduction in cycle time. A PMO must be vested in the idea of small, yet specific tailoring objectives that will add flexibility to their decision-making process and positively affect a program's schedule. However, the DSB report suggests that without developing a new system this adds complexity to an already complex system (USD AT&L, 2009).

E. ACQUISITION WORKFORCE

The Defense Acquisition University (DAU) was established in 1991 as part of the FY 1991 NDAA and Defense Acquisition Workforce Improvement Act in an effort to combat the workforce challenges inherent in a complex acquisition process (Defense Acquisition Portal, 2014). Both internal and external management of programs has been the source of constant literary debate over the years within the DOD and Congress. Riposo et al. (2014) identified five major areas that included 18 sub-areas as reasons cited in acquisition literature that have resulted in schedule delays. Of these five areas, four included some form of management issue.

An USD AT&L (2015a) report identified specific actions the DOD needed to implement in order to improve the capability of its acquisition workforce. Of these actions, the emphasis was placed on career field enhancements in additional hiring and competencies. As a response, a strategic plan of action for the years 2016–2021 was developed and submitted by the end of 2015. As part of this plan, DOD documented the acquisition workforce growth, as depicted in Table 1, to capture functional area growth between FY05 and FY15 (USD AT&L, 2015a).

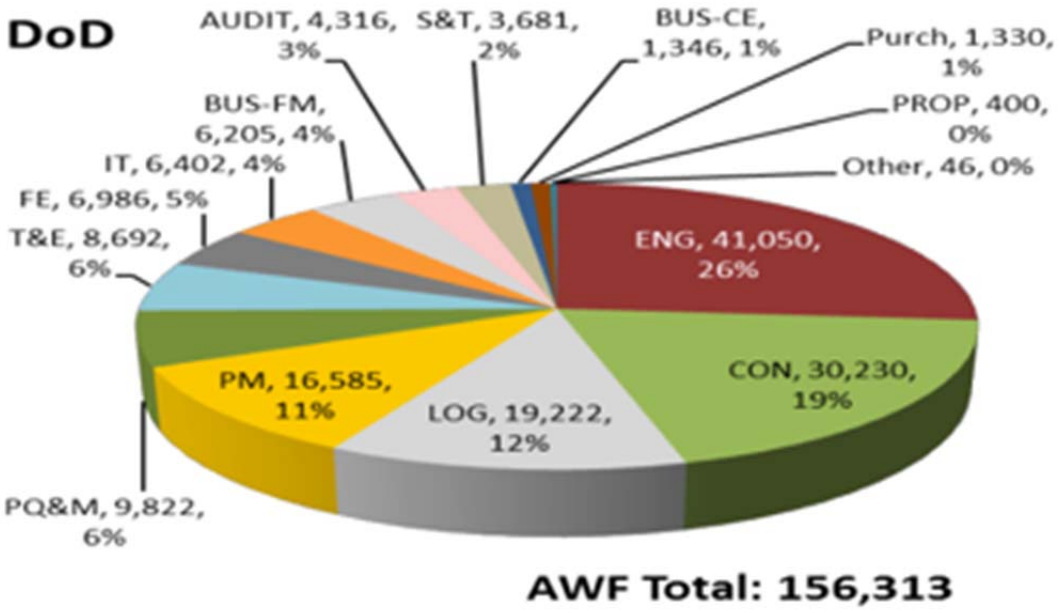
Table 1. Growth of AWF by Functional Area 2008–2015.
Adapted from USD AT&L (2015a).

Overall Defense Acq Workforce Career Field	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	% Change since FY06	% Change since FY14
Engineering	34,752	35,142	34,710	34,537	36,704	39,201	39,690	39,807	39,544	39,242	41,050	19%	5%
Contracting	26,025	27,748	26,038	25,680	27,655	29,792	30,327	30,292	30,271	29,826	30,230	18%	1%
Life Cycle Logistics	12,493	12,332	12,604	13,361	14,852	16,861	17,369	17,539	17,122	17,724	19,222	44%	8%
Program Management	12,284	12,775	12,427	12,781	13,422	14,915	15,683	15,824	16,171	16,003	16,585	30%	4%
Production, Quality, & Man	9,397	8,966	8,364	9,138	9,023	9,727	9,601	9,458	9,658	9,671	9,822	7%	2%
Test & Evaluation	7,384	7,280	7,419	7,420	7,892	8,446	8,573	8,603	8,580	8,569	8,692	17%	1%
Facilities Engineering	8,356	3,927	4,394	4,920	5,420	6,911	7,428	7,290	6,970	6,617	6,986	42%	6%
Information Technology	5,472	4,843	4,423	3,934	4,358	5,165	5,563	5,832	5,870	5,776	6,402	63%	11%
Business (Fin Mgt)	8,119	7,747	7,387	7,085	7,262	7,054	7,009	6,761	6,463	6,142	6,205	-12%	1%
Auditing	3,536	3,486	2,852	3,638	3,777	4,143	4,231	4,505	4,368	4,560	4,316	19%	-5%
S&T Manager	314	291	483	480	623	2,561	3,062	3,209	3,293	3,401	3,681	667%	8%
Business (Cost Est)	-	-	-	-	-	1,070	1,252	1,278	1,312	1,309	1,346		3%
Purchasing	2,438	1,680	1,170	1,196	1,238	1,287	1,276	1,340	1,283	1,205	1,330	11%	10%
Property	571	530	481	451	475	501	483	449	402	389	400	-11%	3%
Unknown/Other	3,229	1,495	3,280	1,258	402	71	344	139	48	31	46		
TOTAL	134,370	128,242	126,032	125,879	133,103	147,705	151,891	152,326	151,355	150,465	156,313	24.2%	3.9%

= decrease = increase

Slightly misleading though, is the percentage of growth relative to information technology. While growth during the years of 2005 to 2015 illustrates a 17% change, the growth from 2005 to 2014 was only 5% with a substantially greater rate of 11% in the last year from 2014 to 2015. While this recent increase appears promising from an IT perspective, information technology professionals consist of only 4% of the total 156,000 personnel acquisition workforce as seen in Table 2 (USD AT&L, 2015a).

Table 2. Acquisition Workforce Status (2014).
Source: USD AT&L (2015a).



Additional literature provides further understanding of how the acquisition workforce relates to IT/IS program performance. In the DOD's 2016 annual report on the performance of the defense acquisition system, Major Acquisition Information Systems (MAIS) program cycle time was explained as being lower since 2009 from a median of five to 3.2 years, but that schedule growth had increased from a median of three months in 2011 to five months in 2015 (USD AT&L, 2016c). On the contrary, David Tate (2016) suggests that the median cycle time and schedule growth for MAIS programs have been increasing since 1990. He further expounds, and this is consistent with both the DOD's 2016 annual report and Rand's 2014 report, that the increase in schedule growth is likely

associated with unrealistic schedule expectations or immature technologies, not necessarily longer cycle times. The USD AT&L (2009) DSB report further expounds on the same claim, citing that schedule overruns specifically in the Joint Tactical Radio System (JTRS) program support the development of a separate IT specific acquisition process. Additionally, the GAO identified management and technological challenges as catalysts for possible future challenges facing the JTRS program in 2003, six years after program inception (GAO, 2003).

In tandem with personnel numbers within the realm of IT, Riposo et al. (2014) identified that an increased knowledge base within the IT workforce facilitates creating the following: realistic schedules foundationally grounded on technological maturity, better comprehension of system complexity, and improved anticipated budget execution requirements. Each of these is pertinent to assessing technical risk within a program/project. In many cases, the lack of IT/IS understanding within program management can lead to initial assumptions or expectations that become problematic to successfully accomplish. This adds to possible requirements creep, schedule slippage and mismanagement of funds through the PM office (Riposo et al., 2014).

Although DOD has significantly increased the IT workforce in recent years, the DSB, the Institute for Defense Analyses (IDA), the Center for Strategic and International Studies (CSIS), Rand Corporation, and GAO have all concluded similar findings. Namely, ineffective program management has been a significant source of the IT acquisition schedule problem.

F. SUMMARY

While much attention has been given to the use of mature technologies or COTS, adjusting funding streams, tailoring programs through rapid acquisition or special contract vehicles, as well as modifying and increasing the acquisition workforce, ineffective management has been a significant factor in the DOD's IT acquisition schedule problem. Timely delivery of IT/IS war-fighting capabilities has suffered as a result. Although addressed nearly nine years ago, the DSB (2009) report called for an independent IT acquisition process as a result of the pace of technology and complexities

inherent in the DOD's acquisition process. The recommendations made ultimately resulted in the development of the Business Capability Life cycle (BCL) that targeted right sizing IT related business systems in support of the DOD and component services. While the intentions of BCL were aimed at mitigating IT delivery issues, there is little evidence to suggest it or other initiatives have resolved the IT/IS problem. We will now transition to three specific MAIS programs to further illustrate schedule issues beyond the aforementioned literature.

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III. EMPIRICAL CASES

Illustrating programmatic issues in regard to timely delivery of capabilities, this chapter presents the execution of three DOD MAIS programs. Issues pertaining to decision-making authorities, the influence of policy and law, and organizational structure are specifically highlighted along with programmatic cost and schedule diagrams. This presentation utilizes documentation submitted through the Defense Acquisition Visibility Environment (DAVE), including, but not limited to Selected Acquisition Reports (SARs) for each program. This chapter ultimately serves as additional information in support of governance challenges currently affecting the acquisition process within the DON.

A. CONSOLIDATED AFLOAT NETWORKS AND ENTERPRISE SERVICES (CANES)

1. Program Description

In order for the Navy to have a greater impact on the cyber domain, the "Consolidated Afloat Networks & Enterprise Services (CANES) is the Navy's only Program of Record to replace existing afloat networks and provide the necessary infrastructure for applications, systems, and services required for the Navy to dominate the Cyber Warfare domain" (USD AT&L, 2016a, p. 5). "CANES is the technical and infrastructure consolidation of existing, separately managed afloat networks including Integrated Shipboard Network Systems, Combined Enterprise Regional Information Exchange System—Maritime, Sensitive Compartmented Information (SCI) Networks, and Submarine Local Area Network," currently all considered legacy systems at the end of service life (USD AT&L, 2016a, p. 5).

The USD AT&L SAR (2016b) summarizes the program:

> CANES will provide complete infrastructure, inclusive of hardware, software, processing, storage, and end-user devices for Unclassified, Coalition, Secret and SCI for all basic network services (email, web, chat, collaboration) to a wide variety of Navy surface combatants, submarines, Maritime Operations Centers, and aircraft. In addition, hosted applications and systems inclusive of Command and Control, Intelligence, Surveillance and Reconnaissance, Information Operations, Logistics and Business

> domains require the CANES infrastructure to operate in the tactical environment. Integrating these applications and systems is accomplished through Application Integration, the engineering process used to evaluate and validate compatibility between CANES and the Navy-validated applications, systems and services that will utilize the CANES infrastructure and services. Specific programs, such as Distributed Common Ground System—Navy, Global Command and Control System—Maritime, Naval Tactical Command Support System, and Undersea Warfare Decision Support System, are dependent on the CANES Common Computing Environment to field, host, and sustain their capability because they no longer provide their own hardware. CANES requires that Automated Digital Network System field prior to or concurrently with CANES due to the architectural reliance between the two programs. (p. 5)

The end goal of CANES is to increase the efficiency of the entire system instituting a reduction in total network baselines afloat while integrating all solutions under a single engineering directive (USD AT&L, 2016b).

2. Program Schedule

As shown in Figure 1 (USD AT&L, 2016b), CANES program inception is dated 2008 with an expected completion, or full operational capability (FOC), date of 2025. Thus, far, the program has not experienced any significant delays or Nunn-McCurdy breaches (USD AT&L, 2016b). As Badua and Warr (2014) illustrated, technology may outpace the current technologies employed in this system. This is based on Moore's law which states that the number of transistors on a circuit have doubled every year since their invention and will continue to do so for the unforeseeable future (Moore, 2017). This has the potential to cause significant delays if the program is not managed correctly. Software and hardware engineering may need significant updating and reconfiguring during later years of the program. Incremental fielding could likely address this issue, though it does not preclude reconfiguration efforts and associated cost and schedule overruns that may be associated. CANES is expected to experience schedule delays as the program moves into the initial operational test and evaluation (IOT&E) for unit-level ships stage (Seligman, 2014).

Schedule Events				
Events	Development APB (Development) 01/10/2011 Objective/Threshold		Production APB (Production) 01/16/2013 Objective/Threshold	
Materiel Development Decision	Dec 2008	Dec 2008	Dec 2008	Dec 2008
Funds First Obligated[1]	Dec 2008	Dec 2008	Dec 2008	Dec 2008
Milestone B[2]	Dec 2010	Jun 2011	**Jan 2011***	**Jan 2011***
Milestone C[3]	Jan 2012	Jul 2012	**Dec 2012***	**Dec 2012***
Full Deployment Decision[4]	Apr 2013	Oct 2013	**Oct 2013***	**Dec 2013***
Full Deployment[5]	TBD	TBD	TBD	TBD

*** Denotes change in Objective/Threshold from prior APB.**

Schedule Events				
Events	APB Change 1 (Production) 06/18/2014 Objective/Threshold		APB Change 2 (Production) 08/05/2016 Objective/Threshold	
Materiel Development Decision	Dec 2008	Dec 2008	Dec 2008	Dec 2008
Funds First Obligated[1]	Dec 2008	Dec 2008	Dec 2008	Dec 2008
Milestone B[2]	Jan 2011	Jan 2011	Jan 2011	Jan 2011
Milestone C[3]	Dec 2012	Dec 2012	Dec 2012	Dec 2012
Full Deployment Decision[4]	**Jun 2015***	**Dec 2015***	**Oct 2015***	**Oct 2015***
Full Deployment[5]	TBD	TBD	**Sep 2024***	**Mar 2025***

*** Denotes change in Objective/Threshold from prior APB.**

Figure 1. Schedule Events. Source: USD AT&L (2016b).

3. Cost Summary

Indicated in Figure 2 (USD AT&L, 2016b), there is a slight rise in procurement and total acquisition costs but overall is projecting a reduction in total life-cycle cost. Nothing suggests at this time, that the cost will increase above the Nunn-McCurdy threshold of 25%, other than the aforementioned technological discussion.

CANES				
Appropriation Category	BY 2012 $M		TY $M	
	Original Estimate	Current Estimate Or Actual	Original Estimate	Current Estimate Or Actual
Acquisition Cost				
RDT&E	574.7	541.3	664.8	628.9
Procurement	3187.7	3249.0	3686.5	3724.3
MILCON	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	0.0	0.0
Total Acquisition Cost	3762.4	3790.3	4351.3	4353.2
Operating and Support (O&S) Cost				
Total Operating and Support (O&S) Cost	6406.8	6019.4	8218.4	7532.3
Total Life-Cycle Cost				
Total Life-Cycle Cost	10169.2	9809.7	12569.7	11885.5

Figure 2. CANES Cost Summary. Source: USD AT&L (2016b).

4. Governance

The CANES program aims to accomplish system and network integration for upwards of 180 ships, submarines, and the Maritime Operations Centers (OPACC, 2011). It relies heavily on multiple levels of decision-making in the planning and execution of its program. Thus, the decision-making process inherently encompasses the risk and understanding involved with such a large-scale IT/IS integration. The Navy completed the first full installation of CANES aboard the Arleigh Burke-class guided-missile destroyer McCampbell (DDG-85) on Nov 6, 2013 (Seligman, 2014). With program completion set for 2025, the system aboard the McCampbell will be 12 years old and considered a legacy system by that time. The program suffers from policy issues as it pertains to the funding of MAIS programs juxtaposed with the evolution of IT/IS systems. This illustrates the innate issues with management and funding policy within the acquisition cycle for MAIS programs. Essentially, IT/IS programs with significant multi-year timelines run the additional risk of becoming obsolete before full deployment can be established regardless of the use of COTS.

B. MOBILE USER OBJECTIVE SYSTEM (MUOS)

1. Program Description

The Mobile User Objective System (MUOS) is the DOD's next-generation UHF satellite communications (SATCOM) system consisting of four geosynchronous satellites and associated ground stations (USD AT&L, 2016b). The MUOS system is being established in order to provide global connectivity between users across terrestrial voice and Internet Protocol (IP) networks (Oetting & Jen, 2011).

MUOS, designed to support greater mobility, higher data rates, and improved operational availability, includes; "a space segment comprised of a constellation of four geosynchronous satellites, plus one on-orbit spare" and "a ground system including the ground transport, network management, satellite control, and associated infrastructure to both fly the satellites and manage the users' communications" (USD AT&L, 2016b, p. 8).

When implemented, MUOS will serve a mixed terminal population providing a voice and data capability with both legacy and newer waveform terminals, capable of supporting the Common Air Interface (CAI) (USD AT&L, 2016b).

2. Program Schedule

The MUOS FOC experienced an Acquisition Program Baseline (APB) breach as a result of a failed operational test and evaluation of the complete system. The follow-on operational test is scheduled for FY2019 with FOC established FY2020, as indicated in Figure 3 (USD AT&L, 2016b).

Schedule Events				
Events	SAR Baseline Production Estimate	Current APB Production Objective/Threshold		Current Estimate
Key Decision Point B	Sep 2004	Sep 2004	Mar 2005	Sep 2004
Key Decision Point C	Oct 2006	Oct 2006	Apr 2007	Aug 2006
Build Approval	Oct 2007	Oct 2007	Apr 2008	Feb 2008
Follow-On Buy	Oct 2008	Oct 2008	Apr 2009	Oct 2008
MUOS On-Orbit Capability	Mar 2010	N/A	N/A	N/A
MUOS Waveform Certification	Apr 2010	N/A	N/A	N/A
2nd Satellite Operational	Mar 2011	N/A	N/A	N/A
MUOS Ready to Ship	N/A	Dec 2011	May 2012	Dec 2011
3rd Satellite Operational	Mar 2012	N/A	N/A	N/A
4th Satellite Operational	Mar 2013	N/A	N/A	N/A
2nd Satellite Ready to Ship	N/A	Sep 2012	Jun 2013	May 2013
3rd Satellite Ready to Ship	N/A	Sep 2013	Jun 2014	Nov 2014[1]
4th Satellite Ready to Ship	N/A	Sep 2014	Jun 2015	May 2015
5th Satellite Ready to Ship	N/A	Sep 2015	Jun 2016	Feb 2016
MUOS Full Operational Capability	Mar 2014	Oct 2016	Jul 2017	Apr 2020[1] (Ch-1)

[1] APB Breach

Figure 3. Schedule Events. Source: USD AT&L (2016b).

3. Cost Summary

Figure 4 (USD AT&L, 2016b) has shown that the total acquisition cost has been reduced due to the removal of the sixth satellite as illustrated above. This did increase the average cost per unit, but is well within the Nunn-McCurdy threshold.

Total Acquisition Cost							
Appropriation	BY 2004 $M			BY 2004 $M	TY $M		
	SAR Baseline Production Estimate	Current APB Production Objective/Threshold		Current Estimate	SAR Baseline Production Estimate	Current APB Production Objective	Current Estimate
RDT&E	3245.2	3684.0	4052.4	3638.1	3636.2	4138.2	4099.6
Procurement	2460.3	2354.2	2589.6	1694.7	3104.1	2896.3	2010.8
Flyaway	--	--	--	1513.1	--	--	1793.1
Recurring	--	--	--	1513.1	--	--	1793.1
Non Recurring	--	--	--	0.0	--	--	0.0
Support	--	--	--	181.6	--	--	217.7
Other Support	--	--	--	181.6	--	--	217.7
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	30.7	30.8	33.9	30.8	34.5	34.6	34.6
Acq O&M	32.7	25.2	27.7	24.4	35.8	26.8	25.9
Total	5768.9	6094.2	N/A	5388.0	6810.6	7095.9	6170.9

Figure 4. Total Acquisition Cost. Source: USD AT&L (2016b).

4. Governance

The schedule of this program has been extended an additional three years due to an APB breach. It is not the extension of this schedule that raises additional issues, rather the DON's decision-making process in choosing to execute a soon to be obsolete technology that would take an additional 13 years to complete. In search of maximum UHF uplink and downlink speeds and overall increased capacity, the program intends to incorporate Wideband Code Division Multiple Access (WCDMA) cellular phone network architecture (USD AT&L, 2016b). The program moved beyond milestone B in 2004. Using the WCDMA architecture at FOC is equivalent to incorporating a 3G cellular network. The 3G cellular standard was introduced in 1998 with the understanding that cellular communication standards evolve every decade (Ghosh et al., 2011). This means a decision on an IT/IS capability to support warfighter requirements was made to launch a program on a cellular standard that was only a few years from becoming obsolete. The FCC approved the 5G standard in 2016 meaning that FOC in 2020 of this program will be at least two generations behind the commercial cellular standard. "5G testing is at its infancy, with major trials expected next year and early deployment of 5G services in 2018" (Snider, 2016). Of note, the life cycle of the MUOS program is scheduled for an additional 10 years after FOC to the 2030 timeframe (USD AT&L, 2016b).

C. JOINT TACTICAL RADIO SYSTEM GROUND MOBILE RADIO (JTRS)

1. Program Description

The Joint Tactical Radio Systems (JTRS) Ground Mobile Radios (GMR), using a common set of JTRS Application Programming Interfaces (APIs), was to enable affordability, increased capacity, and scalability to component services for an inter-operable radio set that adheres to the JTRS Software Communications Architecture (SCA) development cycle (USD AT&L, 2011b). JTRS was a Joint program including the integration of the JTRS Network Enterprise Domain (NED) developed waveforms and ground vehicular applications (USD AT&L, 2011b).

2. Program Schedule

The JTRS Ground Mobile Radio (GMR) program was terminated in October of 2011 after a Nunn-McCurdy breach indicated at the Milestone C Decision in Figure 5 (USD AT&L, 2011b).

Schedule Events					
Events	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	
Milestone B Decision	Jun 2002	Jun 2002	Dec 2002	Jun 2002	
Contract Award	Jun 2002	Jun 2002	Dec 2002	Jun 2002	
Early Operational Assessment					
Start	Apr 2004	N/A	N/A	N/A	
Complete	Jun 2004	N/A	N/A	N/A	
Long Lead Item Procurement Option 1 Approval OIPT	Sep 2004	N/A	N/A	N/A	
Delivery of Airborne B Kits to Aviation for Airworthiness Certification and Integration	Aug 2004	N/A	N/A	N/A	
Development Test/Operational Test/Limited User Test					
Start	Feb 2005	N/A	N/A	N/A	(Ch-1)
Complete	Jul 2005	N/A	N/A	N/A	(Ch-1)
Milestone C Decision	Aug 2005	Jul 2010	Jul 2011	N/A[1]	(Ch-1)
LRIP Option 1 Exercise	Sep 2005	N/A	N/A	N/A	(Ch-1)
First Article Test					
Start	Jan 2006	N/A	N/A	N/A	
Complete	Apr 2006	N/A	N/A	N/A	
MOT&E					
Start	Aug 2006	Oct 2011	Oct 2012	N/A[1]	(Ch-1)
Complete	Oct 2006	Dec 2011	Dec 2012	N/A[1]	(Ch-1)
First Unit Equipped (FUE)	Jan 2007	N/A	N/A	N/A	(Ch-1)
Initial Operational Capability	N/A	Dec 2011	Jun 2013	N/A[1]	(Ch-1)
Full Rate Production In Process Review	Feb 2007	Dec 2011	Dec 2012	N/A[1]	(Ch-1)
Full Rate Production Contract Award	Jan 2007	N/A	N/A	N/A	(Ch-1)

Figure 5. Schedule Events. Source: USD AT&L (2011b).

3. Cost Summary

Though roughly $1 billion was spent in its research and development during the functional requirements process shown in Figure 6, understanding what was truly essential in terms of quantities required led to program cancellation (USD AT&L, 2011b). The Airborne and Maritime/Fixed Station Joint Tactical Radio System (AMF JTRS) lives on; however, this particular program will consist of commercial non-developmental item production ready radios creating a $3.4 billion program (USD AT&L, 2017). The RDT&E number in red in the table references the APB breach.

Total Acquisition Cost							
Appropriation	BY 2002 $M			BY 2002 $M	TY $M		
	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	SAR Baseline Development Estimate	Current APB Development Objective	Current Estimate
RDT&E	845.1	1209.8	1330.9	1454.5[1]	901.1	1356.7	1652.4
Procurement	13592.1	13060.9	14367.1	0.0	18211.8	19387.1	0.0
Flyaway	--	--	--	0.0	--	--	0.0
Recurring	--	--	--	0.0	--	--	0.0
Non Recurring	--	--	--	0.0	--	--	0.0
Support	--	--	--	0.0	--	--	0.0
Other Support	--	--	--	0.0	--	--	0.0
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	0.0	--	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	--	0.0	0.0	0.0	0.0
Total	14437.2	14270.7	N/A	1454.5	19112.9	20743.8	1652.4

[1] APB Breach

Figure 6. Total Acquisition Cost. Source: USD AT&L (2011b).

4. Governance

This program illustrates that lack of organizational structure and a sound decision-making process at the outset of the program will not lead to mission success. Instead of allowing the PMO to extract just the radio and concentrate on the technical level for delivering a capability, a decision was made to develop and design for a significantly higher operational view of a nested requirement. This was done without a great understanding of the numbers required for functional capability. The JTRS GMR program had tremendous challenges integrating ground systems into one singular software-defined system (USD AT&L, 2011a). A GAO (2003) report concluded that the lack of a more effective joint management structure led to the program's inability to

control costs. Though the DOD disagreed with the 2003 GAO report, in 2005 Congress authorized the establishment of an integrated organizational structure called the Joint Program Executive Office (JPEO). The JPEO incorporated a transparent management hierarchy directed by a Joint Program Executive Officer. Its creation "centralized JTRS operations, reduced the scope of the program, revised deadlines, and was able to acquire additional funding" (Gansler, Lucyshyn, & Rigilano 2012, p. 18). This adaptation in the organizational structure of the program allowed the JPEO freedom in their decision-making process. This led to the implementation of an "incremental approach to product development, thus permitting operational experience to inform future product requirements" (Gansler et al., 2012, p. 19).

Though the program failed, elements of the JTRS program are still utilized in the Navy's Multifunctional Information Distribution System (MIDS) JTRS program and the Army's AMF JTRS system, at least in principle. A benefit resulting from ten years of research and development is the contribution to the development of other radio systems. Using similar concepts from the failed program resulted in Harris Corporation producing the Adaptive Networking Wideband Waveform (ANW2) (Burke, 2011), which is now utilized widely by both the Army and Marine Corps.

D. SUMMARY OF PROGRAMS

The programs reviewed expose a necessity for change to ensure a manageable and effective IT/IS acquisition process. Though a small sample, these programs demonstrate that current processes for IT/IS solutions may deliver capabilities outside originally estimated costs, schedule, or performance metrics. However, the ability to fix the issues presented may require additional adjustments to the current acquisition process that are beyond the scope of this thesis. Despite this, it is possible to influence such programs through effective governance at the appropriate organizational level or through adjusted authorities. These cases illustrate that an agreed upon framework must exist early in the process to ensure alignment of the capability being delivered. This must occur within the constraints of time, money, and resources available while still providing sufficient value to the organization.

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IV. DISCUSSION AND ANALYSIS

> Information technology (IT) governance is an integral part of enterprise governance and consists of the leadership, structures, and processes that ensure that an organization's IT sustains and extends its strategies and objectives. IT governance requires a structure and processes to support repeatable decision making, alignment of IT activities to the enterprise's strategic goals and objectives, and a clear understanding of authority and accountability. As with any governance body within an organization, IT governance cannot be viewed, assessed, modified, or changed without considering the rest of the organization's governance bodies and practices (MITRE, 2014, p.59).

The emphasis of this chapter is to further illustrate and relate the governance of IT/IS systems to timely delivery of war-fighting capabilities. We have thus far examined current trends and possible solutions aimed at reducing the cycle time of IT/IS systems. We have also examined three specific IT/IS programs in an effort to further extract causes of prolonged delivery times. In our discussion of these trends and causes, we will now turn to the three elements of governance as defined in our methodology.

A. DECISION-MAKING PROCESSES AND AUTHORITIES THEREIN

1. Workforce Management

As illustrated in Figure 7, the DOD's Life cycle Management System for acquisitions is a complex and robust system that integrates three specific areas: the Joint Capabilities and Integration Development System (JCIDS), the Defense Acquisition System (DAS) and the PPBE process.

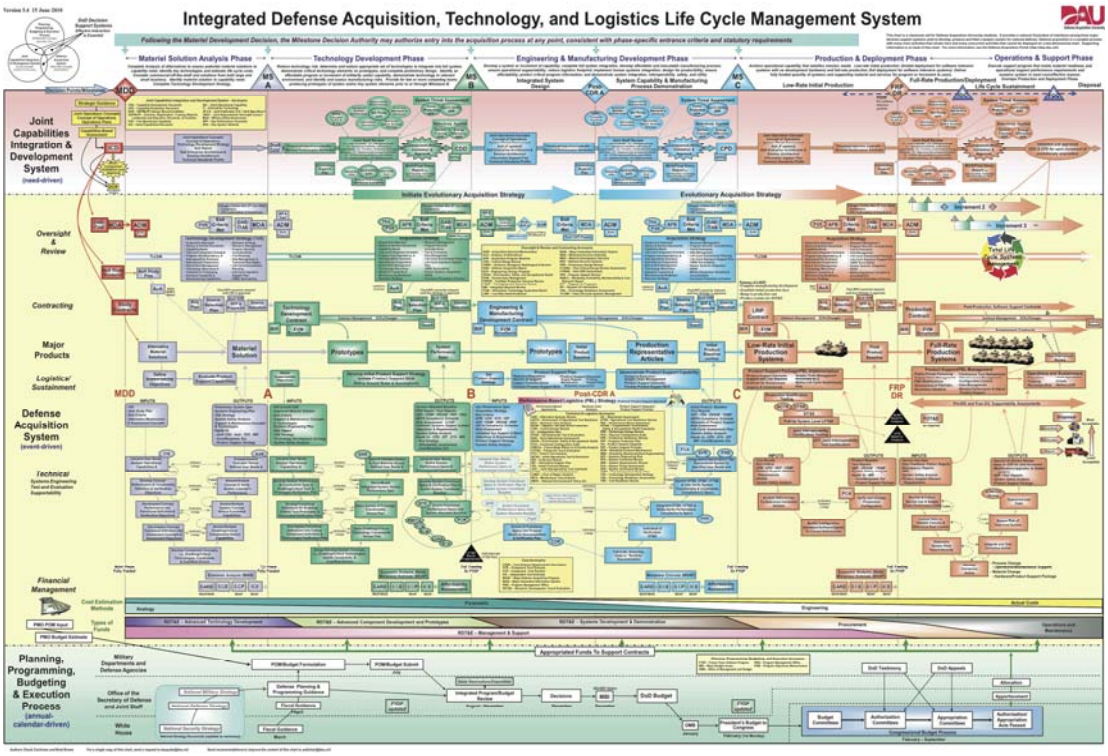

Figure 7. Integrated Defense AT&L Life cycle Management System. Source: Defense Acquisition University (2017).

Better Buying Power (BBP) and other initiatives such as the Business Capability Life cycle (BCL) were developed in an effort to streamline processes associated with program management. This is not to say that management of the acquisition process is beyond the realm of understanding. Rather, that it takes a great deal of process understanding throughout a program's life cycle and the PMO must maintain the fortitude to make effective management decisions.

As Tate (2016) suggested, a shortfall exists between IT-related acquisition professionals and major programs. His assessment infers that regardless of MAIS designation, programs are becoming reliant on software integration. As Riposo et al. (2014) addressed in their report, managing technical risk is a major factor cited in literature for extending program schedules. USD AT&L (2015b) discusses BBP 3.0, which addresses this concern by focusing on improving the acquisition professionals "ability to understand and mitigate technical risk," but is off the mark by only focusing

on strengthening organic engineering capabilities. Non-IT engineers make up 26% of the acquisition workforce (AWF) and while this is not a staggering number, it is the largest percentage of expertise within the AWF (USD AT&L, 2015a). Regardless of program type, more emphasis on software integration requires a greater understanding of IT/IS. This necessitates the need for additional software engineers and other IT-related professionals within the DOD.

The DSB (2009) reported on MAIS programs that experienced an issue with either cost, performance, or schedule identifying 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 (USD AT&L, 2009). BBP initiatives coupled with additional DAU training have attempted to corral these issues since 2010 with BBP's inception, but as Tate (2016) suggests, reductions in cycle times have yet to be realized.

2. Program Tailoring

Tailoring programs to meet specific performance, dollars, or timeline requirements is another aspect of managing the decision making process. BBP 3.0, the DOD's latest acquisition initiative push, is essentially an effort to codify best practices in order to facilitate more effective and efficient program management, productivity, and innovation (Defense Acquisition Portal, n.d.c). One of its major tenets is to continue to "reduce cycle time while ensuring sound investments" (USD AT&L, 2015b, attachment 1). Consistent with this theme, DODI 5000.02 was updated to reflect different 'models' for use in the acquisition process when considering significant program tailoring based on an emergent need (DODI, 2017).

Six recommended or suggested models for tailoring the process to meet a specific requirement range from traditional acquisition (as-is) to a hybrid approach that includes incremental software fielding and intermediate software builds (USD AT&L, 2015b). The interest of this research resides in Model Six, the hybrid approach, as it explicitly states: "This is a complex model to plan and execute successfully, but depending on the

product it may be the most logical way to structure the acquisition program" (USD AT&L, 2015b). Though implementation of this model is challenging, it could lead to a better understanding of the functional and integration requirements of the IT/IS capability. This would allow for more efficient decision-making opportunities in reducing cycle time. In reality, BBP 3.0 is an admission that in order to improve DOD acquisitions more work is required, as a large portion of its recommendations are aimed at tailoring programs and improving the workforce.

As discussed earlier, in an attempt to tailor procurement at lower levels, rapid acquisition offices were introduced across the component services. In our view, these efforts are distinctly associated with the idea of 'tailoring' programs to fulfill specific requirements, especially when dealing with the rapidly changing environment of IT/IS. For the Navy and Marine Corps, these efforts have yet to come to full fruition. Though they do offer the potential for more agile acquisition methods in streamlining processes, a potential pitfall is the possibility for every type of program to rely on their methods. The concept behind tailoring programs is to facilitate process flow based on the type of program being developed. However, some programs may not actually require 'rapid' acquisition and may produce additional unnecessary programmatic risk if tailored in this manner. In addition to this, rapid capability efforts are broad in nature, but not robust enough in capacity to address a variety of system types.

3. COTS and CANES

The idea behind COTS is not that a program will be 100% procured from local stores, but that a majority of the technology found in the program currently exists and is suitable for the program objectives. In addition, not only that it exists, but that it is also mature. COTS allows for the PMO to attempt to mitigate risk involved with the IT, but as mentioned earlier in the F-35 program, the decision to develop IT concurrently with others aspects of the program is a factor in overall schedule slippage. From an IT perspective, this idea of concurrency adds further complexity as more integration is required to sync IT/IS systems or the software used to define them. Within a program, the PMO can drive the idea of concurrency during development, but the implementation and

integration timelines require a distinct alignment in order to meet the desired outcome of concurrent completion. A further issue arises when other technology, or the integration of those technologies, is reliant on a newly developed technology. The inclusion of the COTS mandate in the FAR was an effort to mitigate this issue in that COTS may be used vice developing additional technologies. As the CANES program illustrates however, a focus on COTS may not produce the intended results of reducing overall cycle time from Milestone B to FOC.

The decisions made in the CANES program seem to not consider the overall timeline associated with implementing COTS technologies. In this case, while the decisions made may have reduced the time taken to develop new technologies, the timeline of the program to deploy the COTS hardware/software extends well beyond the current technology being used. COTS, though it implies expediting deployment through the inclusion of complete and mature technologies, still requires an element of integration with or reconfiguration of the baseline network or system upgrades in replacement. Incremental fielding of COTS may address this issue in the CANES program, but hardware/software will require additional updates and this may affect the program's baseline costs in future years depending on the level of integration and inclusion of developing technologies involved. The program currently adheres to a four-year hardware baseline and a two-year software baseline technical update (USD AT&L, 2016d), but is contingent upon the Navy's Next Generation Network (NGEN) to employ Infrastructure and Platform as a Service (IaaS/PaaS) as part of a future cloud-computing environment.

Another issue with the CANES program that is directly tied to decision-making processes is that of operational tempo. The ships are required to be in port or dry dock in order to be upgraded. This extends the program's implementation timeline for the life cycle of the program. While the program remains on schedule issues may arise due to this type of implementation plan. There may be limited alternatives due to the amount of equipment being removed and installed; what is not clear is if program officials examined a more deployable solution to the amount of time required for the upgrades (USD AT&L, 2016d). If the program's ultimate goal is to establish IaaS/PaaS (USD AT&L, 2016d),

then an expedited installation schedule might have been designed and achieved. A larger issue arises as aforementioned: the DON has yet to implement a cloud-computing environment. This directly ties to the authorities currently given to CIOs. Had they been given the ability to develop and execute an effective IT/IS strategy even ten years ago, the DON may not have been playing technological catch-up to an ever-moving target.

4. Network Management

The decision-making processes and authorities therein are also affected by how network management and integration is performed. The Marine Corps Cyber Operations Group (MCCOG) manages the Marine Corps Enterprise Network (MCEN), while Marine Corps Systems Command (MARCORSYSCOM), amongst other program areas, is charged with the acquisition of goods and services in support of the network. As a result, MARCORSYSCOM and Command and Control, Communications, and Computers Directorate (C4) implemented a Configuration Management Board in 2005 as part of their collective Interoperability and Integration Management Plan (I&IMP). In 2010, Director C4 issued the Marine Corps Information Enterprise Strategy (MCIENT) followed by the Enterprise Information Technology Service Management (ITSM) Configuration Management Process Guide and the MCEN unification plan in 2013 and 2014, respectively.

These strategies were issued and implemented to integrate and manage the Marine Corps' network as efficiently and effectively as possible. One of the key issues addressed in the I&IMP and subsequently in the ITSM process guide was that of configuration management. The ITSM process guide specifically identifies roles and responsibilities for configuration management with a dual assignment of both 'accountability' and 'responsibility' to MARCORSYSCOM and the MCCOG while maintaining an 'informed' assignment for C4. While these documents present a clearly defined vision for the future use of the MCEN, roles and responsibilities are not as clearly defined. Thus, this presents a significant challenge for the Marine Corps and ultimately creates additional complexity in the form of multiple management boards that blur the lines of authority. In addition, based on the aforementioned discussion and historical

organizational modifications in roles and responsibilities (Cirillo, 2017), these three agencies, namely C4, MCCOG, and MARCORSYSCOM, have operated with relative dysfunction in coordination with one another. This presents additional challenges for network integration and overall network management as each entity owns a shared piece of authority in the decision making process for managing the network and ultimately identifying IT/IS requirements.

Management and governance within the DON present challenges that may not exist in the private sector. Google Inc., for example, built its network around the idea called Site Reliability Engineering (SRE). This IT management framework is essentially a set of composite functional teams consisting of systems administrators and software engineers (Beyer, 2016). By combining these functions, it has significantly reduced friction between disparate functions and has propelled itself to the top of the networking world based on the company's significant market capitalization. While Google is a completely different type of organization than the DON, its business practices regarding network management offer additional insight into more effectively managing a complex and robust network. Greater understanding and concurrence at a lower level allows for greater understanding of the functional requirements required to deliver a specific capability. Streamlining the decision-making processes and authorities therein, as Google has done, will contribute to more effective DON network management and, subsequently, improve the acquisition process associated to IT/IS systems as a result.

5. Exercising Authorities

Perhaps most significant in our discussion of management and overall governance, is the role of Navy and Marine Corps Chief Information Officers (CIOs). DOD CIOs are quite different from private sector CIOs that own and maintain their respective company IT networks and network assets. In the DOD and DON, the CIO is responsible mostly for vision, strategy, and overall governance/policy residing over their respective network. They have no control over network administration, configuration management, acquisitions, etc. They are responsible for circuit management coordination and enterprise network access, and based on the FITARA (2014) guidance, are also

responsible to track IT spending. Tracking is essentially all the CIO can do, as they maintain no control of funding other than concurring with procurements that are consistent with current federal and component service IT policies. They have no real budget authority.

The FITARA has clearly laid out for service components what their CIOs are responsible for and to whom. Issues arise when CIOs are not given the commensurate abilities to execute said responsibilities. Congress has mandated CIO authorities, and yet the DOD has done little to implement these authorities at the service component level. As the passage at the beginning of this chapter underscores, effective IT governance ensures decision-making is consistent with strategies and policies that ultimately align with IT investments (MITRE, 2014). Expecting a CIO to appropriately align IT investment and strategy if he has no real power to do so is simply unreasonable.

B. LAW AND POLICY

1. Budgetary Policy

Beyond our earlier discussion of congressional appropriations, the popular termed ‘colors of money’ is an important discussion point for the Navy and Marine Corps. It is as much a discussion point of stability as it is a discussion of inflexibility of funding. For the DOD, funding is provided via congressional appropriations in five specific appropriation titles: Military Personnel (MILPERS), Operations and Maintenance (O&M), Procurement, Research and Development (R&D), and Military Construction (MILCON). There is also a separate line of funding for Overseas Contingency Operations (OCO) that is typically associated with the funding of real-world operations as well as a separate funding line for Revolving and Management funds, such as the Defense Working Capital Fund (DWCF). Per 31 USC §1301: “Appropriations shall be applied only to the objects for which the appropriations were made except as otherwise provided by law” (Candreva, 2017).

This funding structure is unlikely to change as Congress and the organization it has created have mandated a significant level of oversight. There are several distinctions to be made with how the duration of funds can be used that directly affects the life cycle

of a program. These distinctions may warrant additional reform in the future to coincide with the rapid pace of technological advancement. Appropriation titles are given a relevant shelf life for obligation.

> Expense-type appropriations like O&M and MILPERS generally have a one-year obligation availability period meaning that new obligations may only be created during the fiscal year of the appropriation that will fund the liability. Investment-type appropriations generally have multiple year obligation availability periods to deal with the complexity and long lead times to acquire a vehicle, aircraft or ship. (Candreva, 2017)

To be distinct, MILPERS and O&M typically have one-year obligation availability; R&D has two-year availability; Procurement has three-year availability; and MILCON has five-year availability.

Obligation rates act as constraining factors for a PMO while navigating through a program's life cycle. As a result, the governance of IT/IS programs, in terms of appropriation limitations, has the potential for devastating effects over the life cycle of a program. An IT/IS program may use each type of appropriation in its life cycle and because of this, lines may be blurred in terms of process flow responsibilities. As we will discuss in the organizational structures section, MILCON funding for IT-incorporated projects is controlled and executed by an entity that has no IT/IS knowledge or in-depth understanding. This may lead to additional procurement delays and overall misalignment of IT/IS strategic policy that ultimately feeds the lack of timely delivery of IT/IS systems.

Funding flexibility may be an avenue to overall program flexibility as it allows for more consistent use of funds as well as additional experimentation with emerging technologies outside of the traditional decision-making process. For example: instead of extracting funds from already appropriated R&D funds, as is common practice, an R&D appropriation with built-in flexibility for use, much like the flexibility provided to the Office of Naval Research, has the potential to mitigate delayed delivery times. (Eckstein, 2017). Vice spending years on alternatives analysis and prototype development with refinement potentially wasting millions in R&D costs, this effort could facilitate more responsive decision-making flows in program acceptance and execution.

2. DON Policy

There are two separate policies or frameworks that we will focus on in this discussion of DON policy that have elements that could also be limiting in nature to the timely delivery of IT/IS capabilities: 1) the Information Technology Procurement Request (ITPR) process, and 2) the Universal Needs Process (UNP), which includes Universal Needs Statements (UNS).

> The intentions of the ITPR process for both the Navy and Marine Corps (US Marine Corps [USMC], 2011) can be summarized by the following passage:
>
> The information technology procurement request/review and approval system (ITPRAS) process ensures the effective and efficient expenditure of funding to: acquire IT capabilities (materiel classified as either hardware, software, and services); safeguard against duplicative investments; align IT procurements and purchases to mission goals and objectives; comply with Department of Defense (DOD), Department of Navy (DON), and Marine Corps policies; and, provide visibility of all Marine Corps fiscal expenditures related to IT (p. 2).

While the intentions are clear, the process may not be as forthcoming as the language suggests. One key element of this process is that it requires a Not-To-Exceed (NTE) dollar amount when submitting a procurement request. This dollar amount is typically an estimate and not an exact amount to be expended, thus the 'visibility of expenditures' provided by the ITPR is not an entirely accurate portrayal. Reconciliation at some level must occur with a comptroller for the exact IT expense/investment if it is to be effectively tracked. As a side note, this reconciliation is focused on identifying accurate appropriation titles vice the exact amount expended (USMC, 2017a).

Second, it is not clear how exactly this process is 'safeguarding against duplicative investments.' The approval chain for an ITPRAS involves multiple agencies within a chain of command and area of operations (AO). Some of which may not be aware of similar type purchases/investments across the Enterprise as many investments occur at the local level and, as a result, may or may not be nested in the overall IT

strategic plan. This may be mitigated by the type of IT investment requested and is ultimately supported by additional policy regarding the variety of IT related purchases, but it does not fully preclude agencies from purchasing systems that may not be in concert with the overall IT portfolio management plan. This is due to the segmented nature of IT that we will discuss further when considering organizational structures.

The intentions of the ITPR process are valid in terms of CIO efforts to generally track and account for IT/IS equipment. Reconciliations must occur that may ultimately lead to longer lead times for additional procurements as an ITPR approval is required for every type of IT/IS purchase. Vetting investments/purchases across the Enterprise takes time, especially if the particular expenditure is not already defined as a Program of Record (POR). Additional guidance though continues to be promulgated regarding the parameters of ITPR approvals in an effort to streamline the process. As of April 2017, USMC Unit Command Coordinators (UCCs) were authorized to approve up to $50,000 for IT local items and services (USMC, 2017b). This modification to existing policy will facilitate IT/IS micro-procurements, but does not necessarily address the strategic alignment of IT/IS procurements to existing or future initiatives such as the Joint Information Environment (JIE).

The UNP, unlike the ITPR process, is focused on identifying urgent requirements that are likely not yet fielded. In essence, UNS support a method for an individual user to request the development of an identified requirement based on a war-fighting need in which a critical gap is perceived to exist. This essentially gives operational units a stronger voice in the overall acquisition and requirements process. Like the ITPR though, it takes time to seek approval for an UNS. First, wherever the requirement originates in the Marine Corps specifically, it must be vetted and approved by an operational command (USMC, 2009). In addition, as MCO 3900.17 further expounds, each UNS is unique and thus the timeline for decision is not finite (USMC, 2008).

The UNS process is essentially a fast track through the traditional acquisition process and, while this may be warranted for traditional type systems such as weapons systems, it may not be ideal for adjudicating rapidly evolving IT/IS systems. When an UNS is sent to Marine Corps Combat Development and Integration (CD&I) and

approved by the Deputy Commandant, CD&I (DC CD&I), it will then be sent to the Marine Requirements Oversight Council (MROC), within which the USMC CIO has no permanent seat. Thus, the UNS process exemplifies another area in which the CIO has no authority or real control in determining IT/IS requirements, as the MROC is the board ultimately responsible for adjudicating overall Marine Corps requirements regardless of the type of system.

C. ORGANIZATIONAL STRUCTURES

As discussed in the JTRS empirical case, the JTRS program lacked an effective joint management structure and this created challenges in controlling program costs (GAO, 2003). In addition to this, organizational structure issues plagued the program from the beginning: "Ensuring the services jointly identify and coordinate requirements of JTRS has been problematic since the program began. Joint program management process has been unable to effectively resolve some interservice differences" (GAO, 2003, p. 18). While the issues exemplified in the JTRS program were considerable, the emphasis of the following discussion is a broader examination of organizational frameworks that may lead to issues such as those seen in JTRS.

1. Ownership

As both the Rand (2014) report and USD AT&L (2009) DSB report have specifically alluded, ineffective program management has been identified as a significant source for schedule delays. Our issue, and reason for this research, reaches well below the top level of the acquisition program management, as there are organizational issues that are preventing cohesive integration of IT/IS acquisitions within the Navy and Marine Corps.

a. Functional Ownership

Issues lie within the distinctions made between the multiple definitions of information technology and where the overall governance resides based on the type of IT/IS system in question. Distinctions are made between the following categories: cabling or wire infrastructure (telecommunications), the facilities used (data centers and other

network nodes), and equipment (IT/IS) therein. While these distinctions are essential to federal law, they have manifested into a convolution of functionality for the Navy and Marine Corps. This begins with the agencies responsible for said infrastructure and equipment.

Naval Facilities Engineering Command (NAVFAC) is charged with the planning, building, and maintenance of Navy and Marine Corps buildings, utilities, and infrastructure (Naval Facilities Engineering Command, 2017). NAVFAC is also responsible for the oversight of military construction (MILCON), which as noted requires its own distinct funding line. In order to execute its mission appropriately and to further identify areas of responsibility, NAVFAC organizes property into two categories: real property and personal property. Most communications assets are not considered real property. However, most, if not all, of the outside plant infrastructure is real property (Chief of Naval Operations [CNO], 2015). This has the potential to cause delays in additional programs for IT infrastructure, as the cabling and physical infrastructure connecting telephony and data circuits is contingent in many cases on MILCON processes and the associated funding. This can greatly affect requirements development for employment of IT/IS assets as MILCONs are racked and stacked each year against competing interests for new buildings and infrastructure throughout the DOD. MILCON funding and infrastructure is a significant aspect of the MUOS program (USD AT&L, 2016b). While it does not blatantly appear to have affected the MUOS program, it is still a planning consideration that may have drawn out the cycle-time of the program beyond designated satellite deployment schedules.

Many smaller programs see challenges pertaining specifically to IT infrastructure. Two additional notes made in this regard are 1) NAVFAC does not manage IT or telecommunications as the utility that it is, and, 2) NAVFAC does not have resident IT knowledge to support required IT planning (Naval Facilities Engineering Command, 2017). Program management within NAVFAC regarding MILCON projects that involve IT is therefore a significant challenge with technical development typically outsourced to Space and Naval Warfare Command through its Navy Working Capital Fund (NWCF) activities (DON, 2016).

b. Agency Ownership

Another issue relates directly to agency ownership. The MCEN, in connection to the Navy's Next Generation Enterprise Network (NGEN), is supported by seven Marine Corps Information Technology Support Centers (MITSCs). The MITSCs are currently responsible to Marine Forces Cyber Command (MARFORCYBER) for network operations but fall under four disparate commands administratively. This creates similar issues addressed with NAVFAC. Different owners equate to different lines of funding and requirements generation that may convolute the process beyond network integration. Adequate and effective IT/IS acquisitions become more difficult as it has the potential to create more opportunity for competing interests and disintegrated systems.

c. Requirements Ownership

As discussed above and previously in the network integration discussion, the lack of control or power creates additional dysfunction. Marine Corps Installations Command (MCICOM) technically owns the infrastructure (buildings and OSP) and pays the subscription rates for each Marine Corps base for access to the DOD Information Network (DODIN) supported by the Defense Information Systems Agency (DISA). HQMC C4, where the CIO resides, is responsible for coordination of the circuits procured as part of the subscription rate. C4 also serves as the approving authority for enterprise network access. But the MCCOG, under MARFORCYBER, runs the network and, between MCICOM, Marine Forces Europe (MFE), Marine Forces Reserves (MFR), and the National Capital Region (NCR), the major data centers of the network are administratively supported. Adding to the confusion, none of these agencies manage acquisitions except to identify requirements. This illustrates three issues:

1. IT requirements become tangled as a result,
2. It may create situations where requirements have to be continually updated causing requirements creep or delivery slippage, and
3. It translates to more agencies involved in the process for approving IT acquisitions or procurements thereby slowing the decision-making process.

2. Ownership Summary

Each of the examples previously illustrated are clearly not representative of the Navy and Marine Corps' acquisition processes specifically. They do contribute to the confusion within the process at multiple levels due to organization misalignment in determining the IT/IS requirements and the strategy they support. USMC CD&I may be charged with identifying and integrating requirements amongst functional areas, but in terms of network integration and the organizational structure in support of it, lines become blurred. Ultimately, this extends into appropriately identifying functional requirements, those being arguably the most important aspect of the life cycle management process (Burch-Bynum, 2013).

D. DISCUSSION AND ANALYSIS SUMMARY

Due to the USD AT&L (2009) DSB report, the DOD focused on improving its workforce, continuing to streamline the acquisition process, and removing additional barriers to effective management through its BBP initiatives. These efforts have simply not been enough to deliver a significant impact on the reduction of IT/IS program cycle time. In addition to workforce expertise issues, decision-making in the form of limited CIO authorities and network management/integration is severely lacking. Beyond this, funding policy, as well as requirement and procurement, policies are further restricting, while the ownership of organizational structures is not fully aligned to ensure effective requirements development and approval processes for more timely delivery of IT/IS capabilities. This conclusion is based on the literature reviewed and research of selected acquisitions reports on two current and one relatively recent MAIS program. Due to these findings and the relative merits of other methods in reducing cycle times, in the next chapter we suggest significant changes to the IT/IS framework within the DON. The impetus for these recommendations remain consistent with a number of the references made in the USD AT&L (2009) DSB report, but also with other initiatives underway aimed at further streamlining IT/IS acquisitions and process flows.

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V. RECOMMENDATIONS

This chapter focuses on three specific recommendations to address current governance issues within the Navy and Marine Corps. We begin first with additional information regarding the 2014 FITARA to further support the reasoning behind the recommended adjustments. In addition, the chapter concludes with focus areas for future research that may further illustrate cycle time and programmatic issues within DON IT/IS acquisitions.

A. THE FEDERAL INFORMATION TECHNOLOGY ACQUISITION REFORM ACT

In 2014, the FITARA prescribed specific requirements for all USG agencies regarding IT/IS budgeting, acquisition, organization and workforce (Office of Management and Budget [OMB], 2015). Congress specifically identified that the Agency CIO is the associated responsible party and that "the head of each covered agency shall ensure that the Chief Information Officer of the agency has a significant role in 1.) the decision processes for all annual and multi-year planning, programming, budgeting, and execution decisions, and 2.) the management, governance and oversight processes related to [IT]" (OMB, 2015). As of 2016, CIO offices, both in the Navy and Marine Corps, maintained limited roles in the aforementioned statutory responsibilities.

This remains consistent with the GAO findings in December of 2016. The report specifically cites examples from all Federal agencies, including the DOD's failed Expeditionary Combat Support Center (GAO, 2016b). The GAO (2016b) concluded that an absence of "disciplined and effective management, such as project planning, requirements definition, and program oversight and governance," was a main cause of recent failed IT projects. The GAO (2016b) report, in looking deeper into management levels, found that governance at the executive-level throughout a wide swath of government agencies has been futile, at least in execution in regard to the CIOs. For example, not all CIOs have the authority to review and approve the entire agency IT/IS portfolio and any authority given is limited (GAO, 2016). To summarize, both Congress

and its accountability office believe the role of the CIO is essential to the effective management of IT/IS equipment and systems as a component of the acquisition process. As the FITARA (2014) states, this includes all aspects of IT from the storage of data to its transmission and reception.

Another key aspect of the FITARA (2014) was the DCOI. As of March 2016, the DOD and service components had completed only 18% of planned data center consolidation, as illustrated in Table 3.

Table 3. DOD Data Center Consolidation Plans from FY 2016 through FY 2018. Source: DOD IG (2016).

Component	Number of Data Centers as of FY 2015	Number of Data Centers Closed as of FY 2015	Additional Data Centers to Close by FY 2018	Total Percentage of Data Centers Closed by FY 2018
Army	1,162	352	140	42%
Marine Corps	90	11	17	31%
Navy	307	47	67	37%
Air Force	1,088	69	519	54%
DISA	24	7	1	33%
All Other DOD Components	444	82	52	30%
Total	3,115	568	796	44%

Though the table numbers are significant in terms of DON data center closures, and projected closures, these numbers may not be fully accurate. A subsequent DOD Inspector General report, in May of 2017, concluded that DOD components did not report complete and accurate IT system data in the DOD Information Technology Portfolio Repository (DITPR) for 19 of 31 systems (Department of Defense Inspector General [DOD IG], 2017). DITPR is the DOD system that tracks and accounts for its IT systems. It is unclear how great an impact this had on the numbers reported in 2016, but ultimately the March 2016 report has been removed from the DOD IG website. These observations suggest that management of information regarding IT/IS at the highest DOD

levels is leading to miscalculations within agencies responsible for data integrity. Nevertheless, these numbers and the findings presented by GAO, the DSB, Rand Corporation, IDA, and CSIS all point to issues with management of IT/IS systems throughout the component services.

B. RECOMMENDATION ONE: CONSOLIDATE IT/IS OWNERSHIP AND FUNCTIONALITY UNDER THE SERVICE LEVEL CHIEF INFORMATION OFFICERS

The USD AT&L (2009) DSB report ultimately concluded that a separate system or process should be developed for IT acquisition. While this has yet to occur, initiatives such as BCL and BBP 3.0 have made efforts to at least offer alternative approaches to the traditional acquisition process for IT/IS programs. In addition, the Marine Corps established a number of initiatives related to the information environment.

One initiative established the MEF Information Group (MIG), designed to inform and support the Marine Air Ground Task Force (MAGTF) Commander with information-related operations officially formalized in 2015. This includes support of the Amphibious Ready Group / Marine Expeditionary Unit (ARG/MEU) construct that directly integrates the Navy and Marine Corps as a fighting force.

Another initiative is the formal inception of the Marine Corps Deputy Commandant for Information (DCI). This essentially places the Director, C4 (CIO) under a Lieutenant General responsible for advising the Commandant of the Marine Corps (CMC) on all matters pertaining to the information domain. This allows for increased activity from the Marine Corps' CIO, as less time is spent advising and assisting CMC staff functions and more time spent developing and integrating IT/IS strategy.

Lastly, MARCORSYSCOM has developed a Cyber Task Force, dubbed the Cyber Acquisition Team (CAT), whose focus is to respond with more agility to emergent and urgent IT/IS related cyber needs.

Each of the these efforts is consistent with the current CMC's vision (Marine Operating Concept) for the future fighting force of the Marine Corps and each has relative merits applicable to consolidated management. Development of these efforts

however, requires additional changes. It may not be prudent to completely consolidate all IT/IS professionals under the CIO's office, though elements of this idea may be practical in properly sizing overall management and integration of the network, including the integration of the current and future IT strategy.

This recommendation follows the essence of this thought process. By consolidating ownership and functionality from the separate agencies under one distinct agency, efforts can be streamlined more effectively. For the Marine Corps, the DCI organization offers an opportunity to force integration between the CIO office and network operators in the form of MARFORCYBER. If each were responsible to report to DCI, each would have a stake in developing concurrent and integrated plans. This would not change MARFORCYBER's operational commitment to USCYBERCOM; it would simply reinforce network integration at the strategic level for the Marine Corps.

The other element to this recommendation is to bring IT/IS elements of CD&I (requirements identification and integration) and MARCORSYSCOM (acquisition professionals) under the CIO umbrella. This does not translate to consolidation of entire agencies for IT/IS acquisitions. Instead, it promotes a 'skunk works' type approach by building a small team of managers to focus on IT/IS acquisitions for current initiatives such as the JIE and DCOI. Each initiative is contingent upon one another and each involves elements of MILCON, Operations, additional procurements, and overall management. A dedicated team such as a permanent Cyber Task Force with the appropriate budget and management authorities is much more able to navigate the complexities of network planning and integration than disparate agencies that each own a piece of the problem and solution.

C. RECOMMENDATION TWO: PROVIDE BUDGETARY AND TASKING AUTHORITY TO SERVICE LEVEL CHIEF INFORMATION OFFICERS

Consistent with the first recommendation, the CIO must be provided management authority to make and enforce required adjustments to the IT portfolio. Budget and contract authority will be required at DCI to facilitate rapid acquisition and integration efforts. This does not require de-consolidation of existing agencies. It simply gives DCI,

and ultimately the CIO office, authority to exercise its statutory responsibilities set forth in the FITARA and other IT reform legislation. Currently, the CIO has advisory responsibilities within the Navy and Marine Corps and limited, if any, ability to enforce legislative regulations. The CIO office has traditionally been forced to insert itself based on its advisory role. However, this is counterproductive as procedures are not in place that mandate consultation with the CIO's office when planning IT/IS acquisitions. By providing these authorities, coupled with an aspect of tasking authority in regard to IT/IS systems, the CIO will have the power to exercise its expressed responsibilities and manage with overall accountability beyond the ITPR process.

D. RECOMMENDATION THREE: PROVIDE FUNDING FLEXIBILITY FOR THE SERVICE LEVEL CHIEF INFORMATION OFFICERS

As discussed in numerous examples, ensuring flexibility in the acquisition and or procurement process is essential for program managers to effectively deliver capabilities within a realistic cycle time. As the BCL and BBP have illustrated clearly, one size does not fit all when it comes to IT/IS acquisitions. Flexibility for program management ultimately translates to contracting and the execution of funds. DISA, General Services Administration (GSA), Army Corps of Engineers (ACoE), MARCORSYSCOM, and SPAWAR all offer alternatives for acquisition professionals for IT/IS procurement. While options exist, additional interagency coordination is required to increase the already available contracting flexibility and this must be pushed down from senior levels. Some program managers and contracting officers remain hesitant to work with those outside the traditional agencies. As we have discussed in an earlier example, SPAWAR is the default option for NAVFAC. The ACoE, DISA, or GSA could just as easily support NAVFAC's IT/IS requirements at a possible reduced rate.

A current funding execution concern is that R&D funding typically has a two-year life cycle, but remains heavily managed by Congress through additional oversight. Agencies within the Navy and Marine Corps, specifically program managers, need the flexibility to execute funding not on a prescribed timeline or bound to restrictive obligation rates, but on the timeline of their respective programs. As a subset of R&D and O&M funds, a need exists for a separate category for IT/IS that has the flexibility to

remain consistent with the pace of technology. Changing the appropriation titles may be too much of a leap forward and regulated at too high of a level for this research, but finding flexibility in allocating and executing funds for IT/IS represents a significant step to effective reform. In order to manage this subset of funding, a separate office should be established that manages IT related funds and coordinates directly with the Cyber Task Force in order to align strategic plans with IT/IS initiatives.

E. SUMMARY

These recommendations attempt to enhance process improvements predominantly at the CIO level. By appropriately aligning CIO authorities to statutory responsibilities the IT/IS requirements and procurement process will be more effective as strategic plans will be aligned with current and future IT/IS programs. Rapid capability efforts must be extended to CIOs in the form of a permanent Task Force. This will ultimately ensure IT/IS acquisitions occur on an expedited and effective timeline. It will also ensure that network management and integration is aligned with IT/IS policy and strategy.

The recommendation presented in this chapter can be summarized with a current example. With its formal inception in 2012, the JIE initiative is the flagship network integration program for the DOD facilitated by DISA. It is essentially the brainchild of net-centric warfare: the idea that everything DOD can and will be seamlessly connected (Defense Information Systems Agency [DISA], 2014). Only four years into the program and the GAO has already challenged the management of the program (GAO, 2016a). Effective management begins with the Navy and Marine Corps' organizational structures and process flows. Without clearly identified requirements from a streamlined and cognizant organization, program managers are left trying to decipher where to begin vice focusing on delivering the capability that is required. Consolidating ownership and functionality and providing the appropriate authorities and additional flexibility at the CIO level, allows initiatives such as JIE to be implemented and executed at a much more effective pace.

VI. CONCLUSION

A. FINAL THOUGHTS

There is little question that IT/IS requirements are increasing with each new technological development and this will undoubtedly continue increasing overall program cycle times. There is a consensus amongst the DOD and higher authorities that change is required to deliver IT/IS-specific capabilities commensurate with the pace of technology. As Tate (2016, p. 10) suggests, "there is some evidence that we may already be reaching the turnover point where software development drives schedule duration." The F-35, as discussed, is a perfect example of software development and its role in driving schedule; the F-35 though was not a MAIS program, nor was it a specific IT/IS program. The issues the program presented are of great concern to future planners and program managers. Programs relying on significant software or IT/IS system integration will become increasingly cumbersome if they are continually treated as traditional programs. As Tate (2016, p. 11) further expounds, "when the role of software in the program is no longer such that the software can be treated as a separable module, but rather as an integrative framework, it will be necessary to manage the program as a software development project with associated hardware and cyber/physical integration, rather than as a hardware development project with associated software."

As illustrated, the current acquisition system is not designed for IT/IS acquisitions, as it does not account for the rapidly changing environment introduced by IT/IS. The private sector has become successful through leveraging technological advancements increasing their market capitalization to unprecedented levels. Using IT, Amazon revolutionized supply chain management and Google demonstrated a capacity for network management previously thought impossible. The DOD and DON have the ability to leverage this same type of technology, but their respective processes require streamlining in order to do so. This begins first with consolidating organizational structures and overall management and ownership of the network. To a degree, JIE will become an element of this integrated management, but without unity of effort and clearly defined roles and responsibilities, the DON will continue to struggle with IT/IS

management while acquisition professionals continue to suffer in their attempted delivery of capabilities to the warfighter.

The DON CIOs maintain distinct roles in this course-correction while the FITARA, amongst other legislation, mandates their role pertaining to statutory responsibilities. However, the CIOs need additional authority and flexibility to fulfill these regulatory roles. As the role of cyber within the confines as a war-fighting domain continues to increase, the DON's ability to provide support to its network operators must be consistent with timely delivery of networking capabilities. From an IT/IS perspective, aligning strategy and mission-centric operations begins first with appropriately aligning business processes.

B. FUTURE RESEARCH

We recommend the following areas warranting further research or analysis:

1. In an effort to identify possible inhibitors to aligning network management across the DON, further examination of these specific inhibitors may be warranted. We recommend a cultural and organizational assessment of the DON, USN, and USMC in order to identify these inhibitors.

2. A thorough cost analysis of MAIS and or CAT II, CAT III programs in the DON since the introduction of the FITARA (2014) and BBP 3.0 (2015b) needs to be conducted. Significant program data was not readily available from DON organizations in order to fully assess cycle times and program data from DON programs below the MAIS level, specifically. This assessment of PMO programs at lower levels, to deliver capability at the technical level vice the system or operational level, is warranted to better understand possibilities within program tailoring with a narrow focus.

3. An analysis is needed to identify additional requirements to formalize an independent IT/IS acquisition cycle and/or process. This should include an assessment of possible impact to other programs by separating IT/IS functionalities from the acquisition related agencies.

4. An assessment of obstructions to modifying appropriation types and processes to include an analysis of the cost of additional oversight. An emphasis would be placed on identifying more fluid funding for IT/IS programs.

5. A cycle time analysis of CAT III and below programs within the USN and USMC may provide supporting evidence to further adjust the acquisition process in order to meet emerging or urgent needs. By examining CAT III programs, this analysis may support additional recommendations in effectively delivering IT/IS programs.

6. An analysis of lessons learned from the Navy Marine Corps Intranet (NMCI) program and how those lessons may apply to future initiatives: such as JIE. This analysis may facilitate further recommendations for streamlining IT/IS programs that are both within and outside of the Defense Acquisition process.

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LIST OF REFERENCES

Badua, R., & Warr, S. (2014, December). *Canes implementation: Analysis of budgetary, business, and policy challenges* (Master's thesis). Retrieved from https://calhoun.nps.edu/handle/10945/44517

Bender, J. (2015, March 20). Pentagon: Here are all the problems with the F-35. *Business Insider.* Retrieved from http://www.businessinsider.com/here-are-all-the-problems-with-the-f-35-that-the-pentagon-found-in-a-2014-report-2015-3

Beyer, B. (2016). *Site reliability engineering: How Google runs production systems.* Sebastopol, CA: O'Reilly Media.

Burch-Bynum, M. (2013). *DOD information technology acquisition: Delivering information technology capabilities expeditiously* (Master's thesis).. Retrieved from https://calhoun.nps.edu/handle/10945/37591

Burke, J. (2011, July 15). *Harris Corporation delivering combat-proven wideband networking to largest-ever U.S. Army network integration evaluation.* Retrieved from https://www.harris.com/press-releases/2011/07/harris-corporation-delivering-combat-proven-wideband-networking-to-largest

Candreva, P. (2017). *National defense budgeting and financial management : Policy and practice.* Charlotte, NC: Information Age Publishing.

Carberry, S. (2017, April 26). Congress pushes DOD on IT acquisition agility. *FCW Online Edition.* Retrieved from https://www.ida.org/idamedia/Corporate/Files/Publications/IDA_Documents/ITSD/2016/P-5287.ashx

Chief of Naval Operations. (2015, June 24). *Navy facilities projects*. OPNAV Instruction 11010.20H. Washington, DC: Department of Navy. Retrieved from https://doni.documentservices.dla.mil/Directives/11000%20Facilities%20and%20Land%20Management%20Ashore/11-00%20Facilities%20and%20Activities%20Ashore%20Support/11010.20H%20-%20CH-1.PDF

Cirillo, M. (2017). *Marine Corps systems command functional authorizing official.* Information Paper. Quantico, VA: Marine Corps System Command.

Cycle Time. (n.d.) In *Cambridge online dictionary*. Retrieved (2017, 24 October) from http://dictionary.cambridge.org/us/

Davenport, C. (2016, March 18). The Pentagon's procurement system is so broken they are calling on Watson. *The Washington Post*. Retrieved from https://www.washingtonpost.com/business/economy/the-pentagons-procurement-system-is-so-broken-they-are-calling-on-watson/2016/03/18/a6891158-ec6a-11e5-a6f3-21ccdbc5f74e_story.html?utm_term=.28a9a473b2e1

Defense Acquisition Portal. (2014, September 9). *New acquisition learning model.* Retrieved from https://www.dau.mil/about/Documents/New%20Acquisition%20Learning%20Model.pdf

Defense Acquisition Portal. (n.d.a). Planning, programming, budgeting, and execution (PPBE) process. Retrieved (2017, September 19) from https://dap.dau.mil/aphome/ppbe/Pages/Default.aspx

Defense Acquisition Portal. (n.d.b). Types of funds. Retrieved September 19, 2017 from https://dap.dau.mil/acquipedia/Pages/ArticleDetails.aspx?aid=9f96cbe4-ed8f-4d20-94c9-b89130c0eb70

Defense Acquisition Portal. (n.d.c). Better buying power. Retrieved September 21, 2017 from http://bbp.dau.mil/

Defense Information Systems Agency. (2014, May). *Enabling the Joint Information Environment (JIE).* Washington, DC: Defense Information Systems Agency. Retrieved from http://www.disa.mil/~/media/Files/DISA/About/JIE101_000.pdf

Eckstein, M. (2017, June 9). Marine Corps calls for more experimentation, rapid acquisition funding. *USNI News Online*. Retrieved from https://news.usni.org/2017/06/09/marine-corps-calls-experimentation-rapid-acquisition-funding

Federal Acquisition Regulation (FAR), 48 C.F.R. § 12.1 (2017). Retrieved from http://farsite.hill.af.mil/

Federal Information Technology Acquisition Reform Act report (FITARA) (to accompany H.R. 1232) (including cost estimate of the Congressional Budget Office). (2014). Washington, DC: U.S. Congress.

Financial Management Regulation (FMR), DOD 7000.14 – R (2015). Retrieved from http://comptroller.defense.gov/fmr.aspx

Fox, J., & Allen, D. (2011). *Defense acquisition reform 1960–2009: An elusive goal.* Washington, DC: Center of Military History, U.S. Army.

Gansler, J., Lucyshyn, W., & Rigilano, J. (2012*). The Joint Tactical Radio System: Lessons learned and the way forward.* Monterey, California. Naval Postgraduate School.

Government Accountability Office. (2003). *Challenges and risks associated with the Joint Tactical Radio System program*. Retrieved from http://www.gao.gov/products/GAO-03-879R

Government Accountability Office. (2016a, July 14). *Joint information environment: DOD needs to strengthen governance and management.* Retrieved from http://www.gao.gov/products/GAO-16-593

Government Accountability Office. (2016b, December 6). *Information technology: Improved implementation of reform law is critical to better manage acquisitions and operations.* Retrieved from http://libproxy.nps.edu/login?url=https://search.proquest.com.libproxy.nps.edu/docview/1829724265?accountid=12702

H.R. 2511. (2017, May 18). *Defense acquisition streamlining and transparency act.* Retrieved from https://armedservices.house.gov/issues/defense-reform

Kendall, F. (2017, January 13). *Getting defense acquisition right.* Fort Belvoir, VA: Defense Acquisition University Press.

Mislick, G., & Nussbaum, D. (2015). *Cost estimation methods and tools*. Hoboken, NJ: John Wiley & Sons, Inc.

MITRE Corporation. (2014). *The MITRE systems engineering guide.* Bedford, MA: MITRE Corporate Communications and Public Affairs. Retrieved from https://www.mitre.org/publications/technical-papers/the-mitre-systems-engineering-guide

Moore, P. Moore's Law. (n.d.). Retrieved (2017, September 19) from http://www.investopedia.com/terms/m/mooreslaw.asp

Naval Facilities Engineering Command. About Us. (n.d.). Retrieved (2017, September 21) from https://www.navfac.navy.mil/about_us.html

Oetting, J., & Jen, T. (2011). The mobile user objective system. *Johns Hopkins APL Technical Digest, 30*(2), 103–112. Retrieved from http://libproxy.nps.edu/login?url=https://search.proquest.com.libproxy.nps.edu/docview/1671288556?accountid=12702

Office of Management and Budget M-15-14. (2015). *Management and oversight of federal information technology*. Retrieved from https://management.cio.gov/implementation/#Attachment-I

Pomerleau, M. (2016, February 24). Navy still has long way toward CANES installation. *Defense Systems Online*. Retrieved from https://defensesystems.com/articles/2016/02/24/navy-canes-nimitz-installation.aspx

Porche, I., McKay, S., McKernan, M., Button, R., Murphy, B., Giglio, K., & Axelband, E. (2012). *Rapid acquisition and fielding for information assurance and cyber security in the Navy.* RAND Corporation. Retrieved from http://libproxy.nps.edu/login?url=https://search.proquest.com.libproxy.nps.edu/docview/1322743792?accountid=12702

Rich, B., & Janos, L. (1994). *Skunk Works: A personal memoir of my years at Lockheed.* New York, NY: Back Bay Books/Little, Brown and Company.

Riposo, J., McKernan, M., & Kaihoi, C. (2014). *Prolonged cycle times and schedule growth in defense acquisition: A literature review.* RAND Corporation. Retrieved from http://libproxy.nps.edu/login?url=https://search.proquest.com.libproxy.nps.edu/docview/1820769076?accountid=12702

Seligman, L. (2014). Navy ups number of CANES installation, despite repeated delays. *Inside the Pentagon's Inside the Navy, 27*(6). Retrieved from http://search.proquest.com.libproxy.nps.edu/docview/1496650593/fulltext/6387138DCAEF4B78PQ/1?accountid=12702.

Senate Armed Services Committee, Office of Chairman, U.S. Senator John McCain. (2017). *Statement by SASC chairman John McCain on Pentagon's defense acquisition system report* [Press release]. Retrieved from https://www.mccain.senate.gov/public/index.cfm/press-releases?ID=9DD9505A-9557-42AB-97DF-44D597E11129

Tate, D. (2016, October). Acquisition cycle time: Defining the problem. *Institute for Defense Analysis.* Retrieved from https://www.ida.org/idamedia/Corporate/Files/Publications/IDA.../D-5762.ashx

Under Secretary of Defense for Acquisition, Technology, and Logistics (2009, March). *Department of Defense policies and procedures for the acquisition of information technology.* Defense Science Board. Retrieved from http://www.acq.osd.mil/dsb/reports/2000s/ADA498375.pdf

Under Secretary of Defense for Acquisition, Technology, and Logistics. (2011a). *Joint Tactical Radio Systems (JTRS) Multifunctional Information Distribution System (MIDS), SAR.* Washington, DC: Department of Defense. Retrieved from https://ebiz.acq.osd.mil/DAMIR

Under Secretary of Defense for Acquisition, Technology, and Logistics. (2011b). *Joint Tactical Radio Systems (JTRS) Ground Mobile Radios (GMR), SAR.* Washington, DC: Department of Defense. Retrieved from https://ebiz.acq.osd.mil/DAMIR

Under Secretary of Defense for Acquisition, Technology, and Logistics. (2012, October 19). Report of the Defense Science Board Task Force on Department of Defense policies and procedures for the acquisition of information technology. Washington, DC: Department of Defense. Retrieved from https://www.hsdl.org/?abstract&did=37450

Under Secretary of Defense for Acquisition, Technology, and Logistics. (2015a). *Acquisition workforce strategic plan*. Washington, DC: Department of Defense. Retrieved from www.secnav.navy.mil/rda/workforce/Documents/donawfstrategicplanaug2010.pdf

Under Secretary of Defense for Acquisition, Technology, and Logistics. (2015b, April 9). *Better buying power 3.0: Achieving dominant capabilities through technical excellence and innovation.* Washington, DC: Department of Defense. Retrieved from http://www.acq.osd.mil/fo/docs/betterBuyingPower3.0(9Apr15).pdf

Under Secretary of Defense for Acquisition, Technology, and Logistics. (2016a). *Consolidated Afloat Networks & Enterprise Services (CANES) SAR.* Washington, DC: Department of Defense. Retrieved from https://ebiz.acq.osd.mil/DAMIR

Under Secretary of Defense for Acquisition, Technology, and Logistics. (2016b). *Mobile User Objective System (MUOS) SAR*. Washington, DC: Department of Defense. Retrieved from https://ebiz.acq.osd.mil/DAMIR

Under Secretary of Defense for Acquisition, Technology, and Logistics. (2016c, October 24). *Performance of the Defense Acquisition System: 2016 annual report.* Washington, DC: Department of Defense. Retrieved from https://bbp.dau.mil/docs/performance-of-defense-acquisition-system-2016.pdf

Under Secretary of Defense for Acquisition, Technology, and Logistics. (2016d). *Consolidated Afloat Networks & Enterprise Services (CANES) MAIS Report.* Washington, DC: Department of Defense. Retrieved from https://ebiz.acq.osd.mil/DAMIR

Under Secretary of Defense for Acquisition, Technology, and Logistics. (2017). *Joint Tactical Radio Systems (JTRS) Airborne, Maritime and Fixed Station (AMF), SAR*. Washington, DC: Department of Defense. Retrieved from https://ebiz.acq.osd.mil/DAMIR

U.S. Department of Defense. (2017, August 10). Operation of the Defense Acquisition System. *DOD Instruction 5000.02.* Washington, DC: Author. Retrieved from http://www.esd.whs.mil/DD/

U.S. Department of Defense Inspector General. (2016, March 29). *DODIG-2016-068: DOD's efforts to consolidate data centers need improvement*. Washington, DC: Author. Retrieved from http://www.DODig.mil/pubs/documents/DODIG-2016-068.pdf

U.S. Department of Defense Inspector General. (2017, May 10*). DODIG-2017-082: DOD components did not report complete and accurate data in the DOD information technology portfolio repository.* Washington, DC: Author. Retrieved from http://www.DODig.mil/reports.html/Article/1204505/DOD-components-did-not-report-complete-and-accurate-data-in-the-DOD-information/

U.S. Marine Corps. (2008, October 17). *The Marine Corps urgent needs process (UNP) and the urgent universal need statement (urgent UNS)* (MCO, 3900.17). Washington, DC, Author. Retrieved from http://www.marines.mil/News/Publications/MCPEL/Electronic-Library-Display/Article/899473/mco-390017/

U.S. Marine Corps. (2009, February 10). *Marine Corps urgent needs process (unp) and the urgent universal need statement (urgent uns)* (MARADMIN, 0087/09). Washington, DC: Author. Retrieved from http://www.marines.mil/News/Messages/Messages-Display/Article/889716/marine-corps-urgent-needs-process-unp-and-the-urgent-universal-need-statement-u/

U.S. Marine Corps. (2011, July 6). *Information technology (IT) funding, approval, and procurement* (MARADMIN, 375/11). Washington, DC: Author. Retrieved from http://www.marines.mil/News/Messages/Messages-Display/Article/888093/information-technology-it-funding-approval-and-procurement/

U.S. Marine Corps. (2017a, August 22). *Financial guidance for information technology (it) purchases* (MARADMIN, 464/17). Washington, DC, Author. Retrieved from http://www.marines.mil/News/Messages/Messages-Display/Article/1285713/financial-guidance-for-information-technology-it-purchases/

U.S. Marine Corps. (2017b, April 12). *Information technology procurement review and approval system (ITPRAS) 50,000 dollar approval threshold* (MARADMIN, 176/17). Washington, DC, Author. Retrieved from http://www.marines.mil/News/Messages/Messages-Display/Article/1149752/information-technology-procurement-review-and-approval-system-itpras-50000-doll/

WORKS CONSULTED

10 U.S. Code Chapter 6 – COMBATANT COMMANDS. Retrieved from https://www.law.cornell.edu/uscode/text/10/subtitle-A/part-I/chapter-6

31 U.S. Code Chapter 13 – APPROPRIATIONS. Retrieved from https://www.law.cornell.edu/uscode/text/31/subtitle-II/chapter-13

Bealon, H. (2016). Net-centricity: A review of DOD net-centric concepts. *CHIPS.* Retrieved from http://www.doncio.navy.mil/chips/ArticleDetails.aspx?ID=7287

Center for Strategic and International Studies. (2017). *The circular firing squad of defense acquisition rhetoric.* Retrieved from https://www.csis.org/analysis/circular-firing-squad-defense-acquisition-rhetoric

Lyngaas, S. (2016, March 22). *Marine Corps rolls up its sleeves on cyber acquisition.* Retrieved from https://fcw.com/articles/2016/03/22/usmc-acquisition.aspx

Office of Public Affairs and Corporate Communications. (2011, November). *Consolidated Afloat Networks and Enterprise Services (CANES) fact sheet.* Space and Naval Warfare Systems Command. Retrieved from http://www.secnav.navy.mil/rda/Documents/canes+overview+for+asn+rda+11-2-11-s.pdf

Secretary of Defense. (2017, February 17). *Establishment of cross-functional teams to address mission effectiveness and efficiencies in the DOD*. Washington, DC: Author. Retrieved from https://www.documentcloud.org/documents/3472810-MATTIS-MEMO-CROSS-FUNCTIONAL-TEAMS.html

Secretary of Defense. (2017, February 17). *Near-term actions required pursuant to the national defense authorization act for fiscal year 2017 and its accompanying conference report.* Washington, DC: Author. Retrieved from https://www.documentcloud.org/documents/3472811-MATTIS-MEMO-AT-amp-L-SPLIT.html

Under Secretary of Defense (Comptroller) Chief Financial Officer. (2016, February). *Defense budget overview. United States Department of Defense fiscal year 2017 budget request.* Washington, DC: Author. Retrieved from http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2017/FY2017_Budget_Request_Overview_Book.pdf

U.S. Department of Defense. (2006, August). *Department of Defense chief information officer desk reference.* Washington, DC: Author. Retrieved from http://DODcio.defense.gov/

U.S. Department of Defense. (Producer). (2015, April, 09*). Press briefing by Deputy Secretary of Defense Bob Work; Undersecretary of Defense for Acquisition, Technology and Logistics Frank Kendall III.* [Interview transcript]. Author. Retrieved from https://www.defense.gov/News/Transcripts/Transcript-View/Article/607039/department-of-defense-press-briefing-on-better-buying-power-30-in-the-pentagon/

U.S. Department of Defense Chief Information Officer. (2017). *Government-wide information technology agency summary.* Retrieved from https://www.itdashboard.gov/drupal/summary/000

U.S. Department of the Navy. (2016, February). *Navy working capital fund.* Washington, DC: Author. Retrieved from http://www.secnav.navy.mil/fmc/fmb/Documents/17pres/NWCF_Book.pdf

U.S. Marine Corps. (2005, September 2). *C4I interoperability and integration management plan (C4I I&IMP).* Quantico, VA: Author. Retrieved from https://dap.dau.mil/policy/Documents/2011/Marine%20Corps%20Systems%20Command%20C4I%20Interoperability%20and%20Integration%20Management%20Plan%20v2.pdf

U.S. Marine Corps. (2010, December 4). *Marine Corps information enterprise strategy*. Quantico, VA: Author. Retrieved from http://www.hqmc.marines.mil/Portals/156/Newsfeeds/SV%20Documents/Marine_Corps_Information_Enterprise_Strategy%20(MCIENT)%20V1.0.pdf

U.S. Marine Corps. (2013, December 4). *Enterprise information technology service management (ITSM) configuration management process guide.* Quantico, VA: Author. Retrieved from http://www.marines.mil/Portals/59/IRM-2300-06A.pdf

U.S. Marine Corps. (2014, April 24). *MCEN unification plan.* Quantico, VA: Author. Retrieved from http://www.hqmc.marines.mil/Portals/156/Newsfeeds/SV%20Documents/MUP_v2_Mar 2014.pdf

U.S. Marine Corps. (2016, September). *The Marine Corps operating concept: How an expeditionary force operates in the 21st century*. Quantico, VA: Author. Retrieved from http://www.mccdc.marines.mil/MOC/

Wood, R. (2013, October). Time is money. *Defense ARJ and Defense AT&L Publications*. Retrieved from http://dau.DODlive.mil/2013/10/01/time-is-money/

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