EXCERPT FROM THE

PROCEEDINGS

OF THE

TENTH ANNUAL ACQUISITION RESEARCH SYMPOSIUM ACQUISITION MANAGEMENT

The RITE Approach to Agile Acquisition

Timothy Boyce, Iva Sherman, and Nicholas Roussel
Space and Naval Warfare Systems Center Pacific

Published April 1, 2013

ACQUISITION RESEARCH PROGRAM
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
NAVAL POSTGRADUATE SCHOOL

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Preface & Acknowledgements

Welcome to our Tenth Annual Acquisition Research Symposium! We regret that this year it will be a "paper only" event. The double whammy of sequestration and a continuing resolution, with the attendant restrictions on travel and conferences, created too much uncertainty to properly stage the event. We will miss the dialogue with our acquisition colleagues and the opportunity for all our researchers to present their work. However, we intend to simulate the symposium as best we can, and these *Proceedings* present an opportunity for the papers to be published just as if they had been delivered. In any case, we will have a rich store of papers to draw from for next year's event scheduled for May 14–15, 2014!

Despite these temporary setbacks, our Acquisition Research Program (ARP) here at the Naval Postgraduate School (NPS) continues at a normal pace. Since the ARP's founding in 2003, over 1,200 original research reports have been added to the acquisition body of knowledge. We continue to add to that library, located online at www.acquisitionresearch.net, at a rate of roughly 140 reports per year. This activity has engaged researchers at over 70 universities and other institutions, greatly enhancing the diversity of thought brought to bear on the business activities of the DoD.

We generate this level of activity in three ways. First, we solicit research topics from academia and other institutions through an annual Broad Agency Announcement, sponsored by the USD(AT&L). Second, we issue an annual internal call for proposals to seek NPS faculty research supporting the interests of our program sponsors. Finally, we serve as a "broker" to market specific research topics identified by our sponsors to NPS graduate students. This three-pronged approach provides for a rich and broad diversity of scholarly rigor mixed with a good blend of practitioner experience in the field of acquisition. We are grateful to those of you who have contributed to our research program in the past and encourage your future participation.

Unfortunately, what will be missing this year is the active participation and networking that has been the hallmark of previous symposia. By purposely limiting attendance to 350 people, we encourage just that. This forum remains unique in its effort to bring scholars and practitioners together around acquisition research that is both relevant in application and rigorous in method. It provides the opportunity to interact with many top DoD acquisition officials and acquisition researchers. We encourage dialogue both in the formal panel sessions and in the many opportunities we make available at meals, breaks, and the day-ending socials. Many of our researchers use these occasions to establish new teaming arrangements for future research work. Despite the fact that we will not be gathered together to reap the above-listed benefits, the ARP will endeavor to stimulate this dialogue through various means throughout the year as we interact with our researchers and DoD officials.

Affordability remains a major focus in the DoD acquisition world and will no doubt get even more attention as the sequestration outcomes unfold. It is a central tenet of the DoD's Better Buying Power initiatives, which continue to evolve as the DoD finds which of them work and which do not. This suggests that research with a focus on affordability will be of great interest to the DoD leadership in the year to come. Whether you're a practitioner or scholar, we invite you to participate in that research.

We gratefully acknowledge the ongoing support and leadership of our sponsors, whose foresight and vision have assured the continuing success of the ARP:

- Office of the Under Secretary of Defense (Acquisition, Technology, & Logistics)
- Director, Acquisition Career Management, ASN (RD&A)
- Program Executive Officer, SHIPS
- Commander, Naval Sea Systems Command
- Program Executive Officer, Integrated Warfare Systems
- Army Contracting Command, U.S. Army Materiel Command
- Office of the Assistant Secretary of the Air Force (Acquisition)
- Office of the Assistant Secretary of the Army (Acquisition, Logistics, & Technology)
- Deputy Director, Acquisition Career Management, U.S. Army
- Office of Procurement and Assistance Management Headquarters, Department of Energy
- Director, Defense Security Cooperation Agency
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- Director, Office of Small Business Programs, Department of the Navy
- Director, Office of Acquisition Resources and Analysis (ARA)
- Deputy Assistant Secretary of the Navy, Acquisition & Procurement
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Acquisition Management

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> *Naval Postgraduate School*

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> *University of Maryland*

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> Danielle Worger and Teresa Wu, *Arizona State University*
> Eugene Rex Jalao, *Arizona State University and University of the Philippines*
> Christopher Auger, Lars Baldus, Brian Yoshimoto, J. Robert Wirthlin, and John Colombi, *The Air Force Institute of Technology*

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> Lisa Brownsword, Cecilia Albert, Patrick Place, and David Carney
> *Carnegie Mellon University*

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> Linda McCabe and Anthony Wicht
> *Massachusetts Institute of Technology*

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> Andrew P. Moore, William E. Novak, Julie B. Cohen, Jay D. Marchetti, and Matthew L. Collins
> *Software Engineering Institute, Carnegie Mellon University*

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Mary Maureen Brown
University of North Carolina Charlotte

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University of North Carolina at Charlotte
Ansaf Salleb-Aoussi, *Columbia University, Center for Computational Learning Systems*

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Naval Postgraduate School

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Naval Postgraduate School

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Timothy G. Hawkins, *Naval Postgraduate School*
Michael E. Knipper, *771 Enterprise Sourcing Squadron USAF*
Timothy S. Reed, *Beyond Optimal Strategic Solutions*

The RITE Approach to Agile Acquisition

Timothy Boyce—Boyce has over 25 years of experience in C4ISR, including serving as the head of the Strike Planning and Execution Branch at SSCPAC. He currently provides project management and technical support to the Global Command and Control System–Joint (GCCS-J) Integrated Imagery and Intelligence (I3) and JMS programs. Previously, Boyce served as the assistant program manager for logistics for Naval Mission Planning Systems at the Strike Planning and Execution Systems Program Office (PMA-281). Boyce has a Bachelor of Science degree in information systems management and is certified DAWIA Level III in information technology and Level II in program management and life cycle logistics. [timothy.boyce@navy.mil]

Iva Sherman—Sherman has eight years of experience providing engineering and program management in C4I systems. Born in the former Soviet Union, she immigrated to the United States in 1996 and graduated from Drexel University, summa cum laude, with a Bachelor of Science degree in computer science, a Bachelor of Arts degree in accounting, and a Master of Science degree in software engineering. Since her start at SSCPAC, Sherman has worked on a broad spectrum of projects, including Joint Mission Planning Systems, U.S. Coast Guard Deepwater Command and Control Systems, IAVAssure, Joint Services Imagery Processing System–Navy, and GCCS-J I3. [iva.sherman@navy.mil]

Nicholas Roussel—Roussel has 24 years of government service and serves as the head of the Advanced C2I Engineering Branch at SSCPAC. A Massachusetts native, Roussel joined the Air Force reserves and government service at age 18 and has since provided dedicated professional service to the USAF, NAVSUP, and SSCPAC. Roussel has a Bachelor of Science degree in management and a Master of Business Administration degree in finance, and he is certified DAWIA Level III in acquisition logistics and Level II in program management. Since starting at SSCPAC, Roussel has worked on a broad spectrum of projects, including Joint Mission Planning Systems, Tomahawk Command and Control System, Joint Services Imagery Processing System–Navy, and GCCS-J I3. [nicholas.roussel@navy.mil]

Abstract

As directed by the National Defense Authorization Act (NDAA) of 2010, Public Law 111-84, the defense acquisition community is transitioning in an effort to adopt software best practices for delivering information technology in an incremental and iterative model. The Deputy Secretary of Defense provided a report to Congress titled *A New Approach for Delivering Information Technology Capabilities in the DoD,* delineating the overarching framework to reform the acquisition of information technology to better address and fulfill warfighter requirements. Many governmental agencies, anticipating future directives, are implementing Agile software development methodologies and demonstrating success using these methodologies on DoD-sponsored programs. As an example of this, the Rapid Integration and Test Environment (RITE) established by SSC Pacific in 2008 provides a standardized Agile development environment for its C2 programs. Much of the work to date has addressed program items controlled at lower command levels while awaiting restructuring of the acquisition milestone and review requirements specified in DoDI 5000.02. This report presents the research completed in analyzing traditional acquisition program milestone reviews and documentation requirements and identifies streamlining opportunities that support Agile development. The report also validates the RITE initiative in providing the structured engineering approach that makes Agile development viable in a DoD acquisition environment.

Introduction

The National Defense Authorization Act (NDAA) for Fiscal Year 2010, Public Law 111-84, Section 804—hereafter referred to as Sec. 804, 2010 NDAA—established the requirement for the Department of Defense (DoD) to streamline the acquisition of

information technology. In response to that request, the Office of the Deputy Secretary of Defense (2010) provided a report titled *A New Approach for Delivering Information Technology Capabilities in the DoD.* This report created the overarching framework to reform the acquisition of information technology to better address and fulfill warfighter requirements. While this new requirement established the basics for streamlining information technology acquisition, it did little to provide meaningful, actionable practices that an acquisition program can execute. The goal of this research was to identify opportunities to create actionable Agile processes that information technology programs can use to execute streamlined programs.

Background

The Sec. 804, 2010 NDAA requirement established the parameters for the new acquisition process based on the March 2009 report of the Defense Science Board (DSB) Task Force titled *Department of Defense Policies and Procedures for the Acquisition of Information Technology.* The report was required to include several characteristics that Congress determined necessary for successful implementation:

1. early and continual involvement of the user;

2. multiple, rapidly executed increments or releases of capability;

3. early, successive prototyping to support an evolutionary approach; and

4. a modular, open-systems approach. (NDAA for Fiscal Year 2010, 2009)

These characteristics are significant in that they also describe the elements indicative of an Agile development methodology.

In response to Sec. 804, 2010 NDAA, the DoD provided a report to Congress highlighting its plans to reinvent the IT acquisition process. Noting the departure necessary from a traditional acquisition process, the DoD provided the following:

Acquisition activities in the new process for delivering IT capability will differ significantly from the traditional weapon system development acquisition process and will be separately defined in DoD IT acquisition policy issuances. The IT acquisition process will be agile to respond to a dynamic technology environment and to address unique challenges, such as cyber threats (Office of the Deputy Secretary of Defense, 2010, p. 9).

As shown in the next section, this approach provides a flexible structure dedicated to positive, customer-driven outcomes.

Agile Development

Agile development focuses on close customer interaction and rapid, iterative, and incremental development cycles that produce a working product. This approach focuses on early feedback and flexibility adapting to customer needs.

In describing Agile methods, Lapham et al. (2011) noted that the concepts and practices associated with Agile development arose out of the Agile Alliance. In an effort to identify an alternative to elaborate and time-consuming software development processes, the Agile Alliance created a set of values that focus on people, collaboration, and development of quality software products for their customers (Lapham et al., 2011, p. 1).

The Agile Alliance's efforts resulted in the Agile Manifesto for Agile Software Development:

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

Individuals and interactions over processes and tools
Working software over comprehensive documentation
Customer collaboration over contract negotiation
Responding to change over following a plan
That is, while there is value in the items on the right, we value the items on the left more. (Lapham et al., 2011, p. 1)[1]

Critics of Agile development cite documentation reduction as problematic in development efforts, but these concerns are discounted by seasoned developers. In Agile development, the amount of documentation is determined by the software, not the desire of the developer. It is essential to understand that while documentation is important, it should not act as a replacement for communication and collaboration. Regarding Agile development's approach to documentation, Lapham, Williams, Hammons, Burton, and Schenker (2010) observed, "The Agile community would argue instead that documentation is important, but no more documentation should be created than is absolutely necessary to support the development itself and future sustainment activities" (p. 4). Documentation developed using the Agile methodology can support the intent and objectives of the documentation requirements of the DoD acquisition process.

Agile development is not the only initiative working to streamline and improve the effectiveness of development activities. The Space and Naval Warfare Systems Command (SPAWAR) Rapid Integration and Test Environment (RITE) initiative focused their efforts on key areas in the development cycle that work collectively to shorten cycle-time and improve the efficiency of the development effort.

Rapid Integration and Test Environment

In 2008, the Program Executive Office (PEO) Command, Control, Communications, Computers, and Intelligence (C4I), Command and Control Program Office (PMW 150) began implementation of the RITE initiative. This initiative was born out of necessity in that the existing process for requirements definition and management, as well as processes for software development, did not consistently deliver high-quality Navy Command and Control (C^2) systems either on time or within budget.

The RITE initiative, as implemented, represents a new life cycle model for Navy C^2 software that meets many of the process objectives identified in Sec. 804, 2010 NDAA and improves efficiencies in Navy C^2 application development. RITE places increased emphasis on early and frequent customer interaction and software testing, as well as necessary software engineering practices at the source code level. RITE is a structured approach to software development, taking full advantage of technology advances and open-source models to automate processes and shorten development cycles—thereby increasing the maintainability of the software baselines. The new automated processes also allow a reduction in low-value-added processes and manually developed reports, further streamlining the acquisition cycle and improving efficiencies. The initiative clarifies software delivery requirements, adds additional engineering rigor to deliverables, and reduces the opportunity for misunderstanding between end users and developers. Lastly, RITE uses a centralized information repository that allows all stakeholders to communicate, coordinate, and collaborate virtually.

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[1] The Manifesto for Agile Development was created during a meeting of representatives from across the nascent Agile community and included the following: Kent Beck, Mike Beedle, Arie van Bennekum, Alistair Cockburn, Ward Cunningham, Martin Fowler, James Grenning, Jim Highsmith, Andrew Hunt, Ron Jeffries, Jon Kern, Brian Marick, Robert C. Martin, Steve Mellor, Ken Schwaber, Jeff Sutherland, and Dave Thomas.

As RITE has evolved and process improvements have been realized, additional uses for RITE in support of the C^2 life cycle have been identified. This support includes facilitating close collaboration with outside agencies to ensure that the development knowledge and test and evaluation (T&E) results are shared in order to reduce overall project time. Figure 1 shows the RITE processes as they align with all four phases of the new IT acquisition life cycle. The arrows indicate areas where RITE (consisting of people, processes, and infrastructure) directly supports the acquisition of Navy C^2 capabilities and systems.
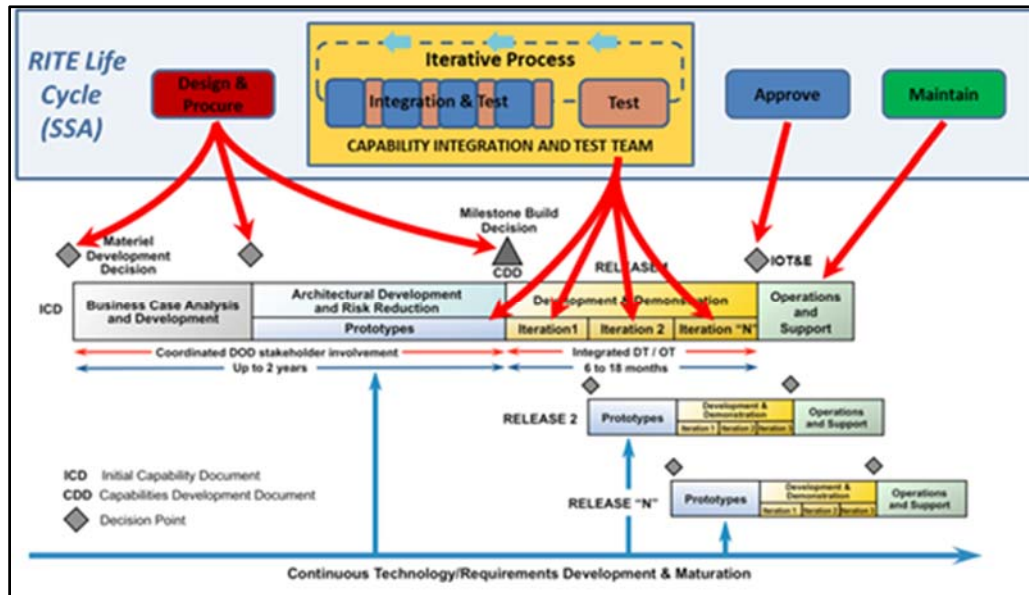

Figure 1.   RITE Alignment With 2010 IT Acquisition Changes

Defense Acquisition Management System

The Defense Acquisition Management System (see Figure 2) is the management process guiding all DoD acquisition programs. The initiating directive, DoD Directive (DoDD) 5000.01, provides the policies and principles that govern the defense acquisition system, and DoD Instruction (DoDI) 5000.02, Operation of the Defense Acquisition System, provides the management framework that implements these policies and principles. "The Defense Acquisition Management Framework provides an event-based process where acquisition programs progress through a series of milestones associated with significant program phases" (DoD, 2012).

The Defense Acquisition Management System is used throughout the DoD as the single overarching methodology for acquiring business and weapons systems.
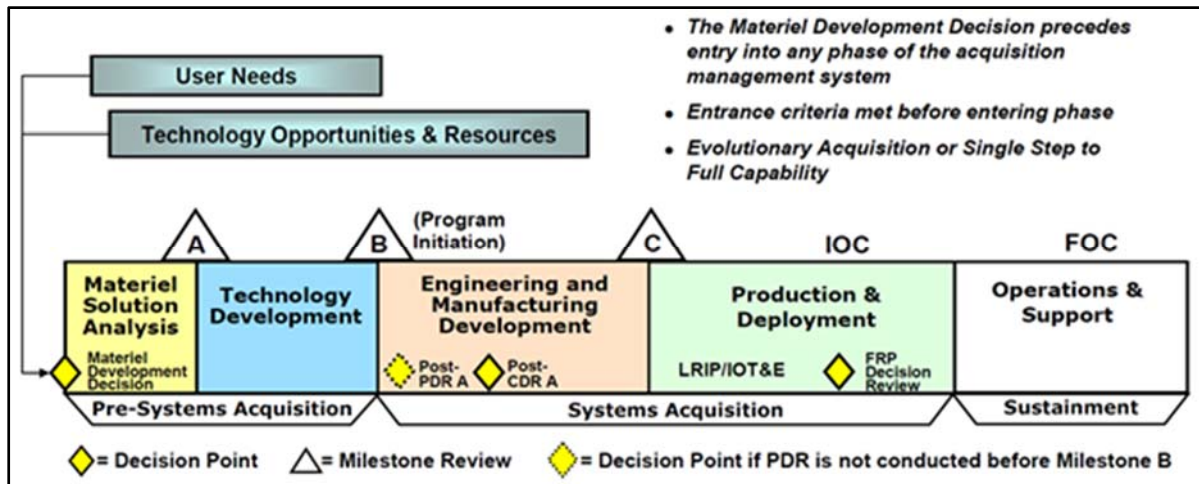
Figure 2. The Defense Acquisition Management System

Related Research

Defense Science Board Task Force Report on Department of Defense Policies and Procedures for the Acquisition of Information Technology

In March 2009, the DSB Task Force reported on the evaluation of the acquisition of information technology (IT) within the DoD. This report identified critical problems with the management of IT acquisitions using an enterprise approach resulting in a "profound operational impact" (DSB Task Force, 2009, p. 1). The report identified problems in responsiveness and the ability to address operational needs. Citing a 2006 DSB study titled *Information Management for Net Centric Operations*, the report noted,

> Especially important, according to the 2006 report, was that much of the military capability used to support the conflicts was paid with supplemental funding—programs that were not part of the Department's planned capability. This circumstance reflects the fact that the need for such programs could not be predicted during previous core program and budget planning, and the system was not sufficiently agile to react once the need was apparent. (DSB Task Force, 2009, pp. 1–2)

The report goes on to identify the evolution of weapons system software reliance in the 1970s at 20% to as much as 80% in 2000. This is a critical issue in light of the reduction in U.S. computing graduates and qualified expert government staff and increased reliance on IT at a time of rising vulnerabilities and threats (see Figure 3; DSB Task Force, 2009, p. 6).
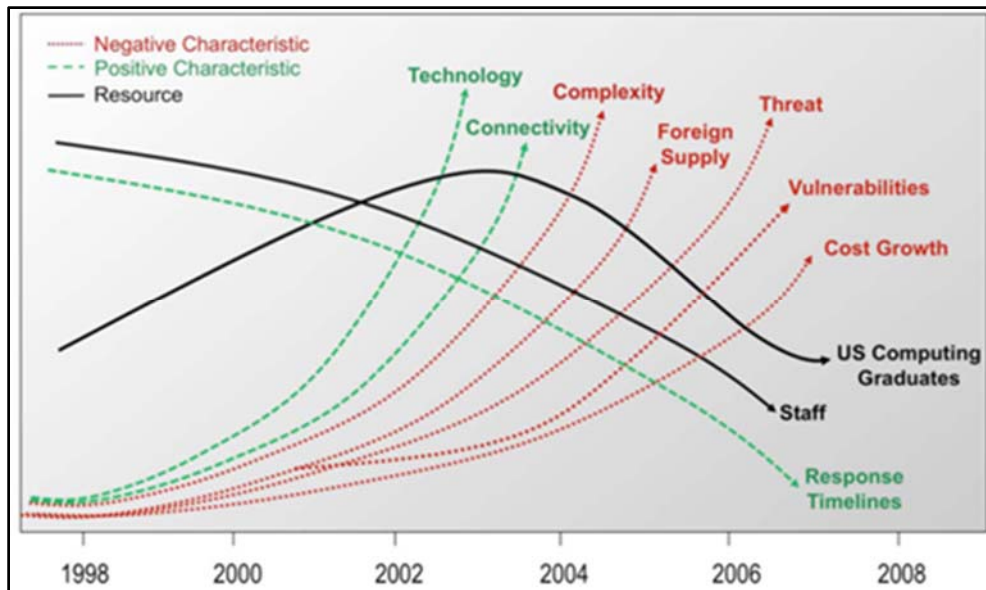
Figure 3.   The Perfect IT Storm
(DSB Task Force, 2009)

The DSB Task Force's findings identified the need for a unique acquisition process for IT. Commenting on the failure of major defense systems, the task force also identified the need to shorten the lengthy acquisition process and to provide the flexibilities necessary to support continuous changes and upgrades. Other critical elements of change identified by the DSB Task Force include the need to align acquisition authorities and organizational structure under the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD[AT&L]) to better manage the technical aspects of IT acquisitions and the need to consider proven experience as an added component in evaluating the education and certification of members of the acquisition workforce.

Considerations for Using Agile in DoD Acquisition (Carnegie Mellon University, Software Engineering Institute)

This document was created to provide additional information on Agile development as it relates to DoD acquisitions, references actual DoD programs that have benefited from the adoption of Agile practices within their respective programs, and includes analysis of relevant literature regarding Agile development. Lapham et al. (2010) answered many questions regarding Agile development, but they specifically answered whether Agile development methods are able to produce better products within cost and schedule requirements (yes) and addressed the barriers which inhibit the DoD's adoption of Agile development methods.

In determining the barriers to DoD's Agile development adoption, Lapham et al. (2010) noted,

> The barriers to adopting Agile in the DoD appear to be primarily cultural. That is to say that there is little in the way of regulation or guidance provided in DoDI 5000.02 that would prevent the use of Agile. This instruction does impose specific constraints on the acquisition office, but these constraints would be true of any development environment. (p. 27)

While not finding any primary barriers within the DoDI 5000.02, Lapham et al. (2010) did address issues with the Federal Acquisition Regulation, citing the need to address

contracting requirements to support Agile development. These changes would require the accommodation of Agile as part of a system's acquisition strategy at the beginning of a program development effort (Lapham et al., 2010, p. 27). The authors also pointed to significant concerns regarding milestone reviews within the DoD acquisition system:

> A very specific acquisition issue and sticking point is that Agile methodology does not accommodate large capstone events such as Critical Design Review (CDR), which is usually a major, multi-day event with many smaller technical meetings leading up to it. This approach requires a great deal of documentation and many technical reviews by the contractor. (Lapham et al., 2010, p. 13)

In addressing the primary questions raised regarding Agile development and its use within the DoD, Lapham et al. (2010) noted that end-user participation and culture are issues that must be addressed before using Agile methods within a program (p. 44).

Agile Methods: Selected DoD Management and Acquisition Concerns (Carnegie Mellon University, Software Engineering Institute)

This document is the second in a series regarding Agile development methods and the use of Agile within the DoD. While focusing on a better understanding of Agile development as it pertains to the DoD acquisition system, Lapham et al. (2011) targeted this report to address Agile development implementation approaches for acquisition and development personnel (p. 2).

Lapham et al. (2011) provided thorough discussions of Agile development, why Agile methods are increasing within the DoD, contracting requirements for implementation within Agile programs, and the use of change management within an organization, specifically applicable to a program management office (PMO), to implement Agile methods. Most applicable to the analysis within this paper is the discussion of milestone reviews within systems development and its effect on Agile development. (Lapham et al., 2011, pp. 10–11). The authors provided a thorough evaluation of milestone reviews, including the effort required to produce the supporting documentation and not the challenges associated with adapting a program's milestone reviews to an Agile methodology:

> The intent of any technical milestone review is for evaluation of progress and/or technical solution. For PMOs trained and experienced in the traditional acquisition methods, evaluating program progress and technical solutions follows well established guidelines and regulations. Very specific documentation is produced to provide the data required to meet the intent of the technical review as called out in the program specific Contract Data Requirements List (CDRL). The content of these documents and the entry and exit criteria for each review is well documented. However, even in traditional acquisitions (using traditional methods), these documents, exit and entry criteria can be and usually are tailored for the specific program. Since the documentation output from Agile methods appears to be "light" in comparison to traditional programs, the tailoring aspects take on additional aspects. Some of the specific challenges for Agile adoption that we observed during our interviews that must be addressed are as follows:
>
> - incentives to collaborate,
>
> - shared understanding of definitions/key concepts,
>
> - document content—the look and feel may be different but the intent is the same—and

- regulatory language. (Lapham et al., 2011, pp. 38–39)

Analytical Approach

The analytical approach involved exhaustive analysis of technical reviews and documentation to identify possible areas in which duplication or overlap currently exists within the review structure or the documentation set required when developing a product.

The review included a thorough analysis of all milestone reviews and documentation associated with a typical development effort. The analysis examined the technical definition of each review, the statutory or regulatory requirement upon which it is based, the program participant/organization responsible for execution of the review, the program participant/organization responsible for conducting the review/completing the document (subordinate organization—typically Software Support Activity [SSA], In-service Engineering Agent [ISEA], etc.), key team members involved, entrance and exit criteria for the review, recipient of the completed review results (PEO, Milestone Decision Authority [MDA], etc.), any other stakeholders, and previous and next process flow steps. The review process was refined to focus on the following milestone reviews: Preliminary Design Review (PDR), Critical Design Review (CDR), Test Readiness Review (TRR), System Verification Review (SVR), and Production Readiness Review (PRR), which were evaluated against Agile development requirements. Further analysis was conducted against the DoD and SPAWAR Systems Command (SPAWARSYSCOM) System Engineering Technical Review (SETR) PDR and CDR Risk Assessment Checklists to provide a cross-referenced analysis against PDR and CDR requirements. These checklists were targeted due to their complexity (The DoD PDR checklist is 860 line items, and the DoD CDR checklist is 929 line items) and their applicability within development timelines associated with Agile development. Although SPAWARSYSCOM SETR checklists for PDR/CDR closely follow the DoD checklists (with 871 and 906 line items, respectively), the difference in line items represents tailoring to address Navy specific requirements.

The documentation analysis included an evaluation of which milestones within the defense acquisition system required completion or updating of each specific document. Additionally, the evaluation included the review of the documentation set required by the SPAWARSYSCOM SETR Risk Assessment Checklists.

Results

This section highlights the pertinent analysis of the reviews and documentation information collected during the preliminary part of this effort. Discussions with experienced program professionals and other acquisition workforce personnel also occurred during the data collection and analysis phases to better inform the group's decision-making process.

Of note, during the analytical phase of this effort, discussions regarding the role of the cognizant technical authority (TA) and their impact (positively or negatively) on the viability of the development effort. According to the Naval Warfare Systems Certification Policy, a TA's role within an organization is as follows:

> The entity with the authority, responsibility, accountability, and technical integrity to establish, monitor, and approve technical standards, tools, and processes in compliance with applicable DoD and DoN policy, requirements, architectures, and standards. (DoN, 2012, pp. B–6)

While the TA's role is focused on institutional level technical compliance, the TA's role remains secondary to the program manager's (PM's) and MDA's role in validating and approving the planned milestone review and programmatic documentation streamlining efforts. Even so, the TA's role as the technical advocate in support of development methods

such as Agile cannot be overstated. A TA's commitment (and through extension, a command's commitment) to Agile development can be helpful in supporting the MDA's decision to approve a PM's request to eliminate or otherwise minimize documentation requirements.

Primary Review Analysis

The initial analysis of technical reviews included the following: Initial Technical Review (ITR), Alternative System Review (ASR), Integrated Baseline Review (IBR), System Requirements Review (SRR) ,Technology Readiness Assessment (TRA), System Functional Review (SFR), PDR, CDR, TRR, SVR, Functional Configuration Audit (FCA), PRR, Operational Test Readiness Review (OTRR), Physical Configuration Audit (PCA), Integration Readiness Review (IRR), In Service Review (ISR), Development Test Readiness Review (DTRR), and Operational Test Readiness Review (OTRR). Although this analysis was an essential first step and helped to visualize individual reviews within the context of the DoD Acquisition Management System (see Figure 4), no major streamlining opportunities were identified in the analysis.
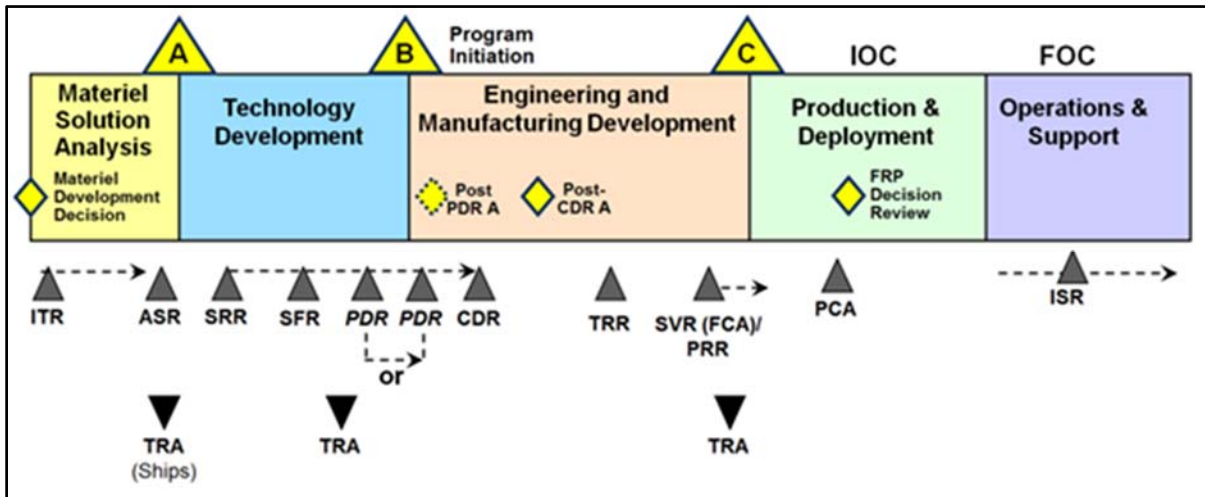

Figure 4.   System Engineering Technical Reviews According to the DoD Acquisition Management System

In evaluating the reviews against Agile development principles, it was evident that to achieve any streamlining within the review process, the numerous review requirements would need to be downsized and re-envisioned to address the primary elements of the existing reviews. This was preliminarily documented in the DSB Task Force's (2009) report *Department of Defense Policies and Procedures for the Acquisition of Information Technology* (see Figure 5). The DSB Task Force's (2009) recommendation streamlined the milestone review process to eliminate the complex, all-encompassing milestone reviews in favor of more frequent, tailored decision points that enable a program to identify problems earlier, which results in more "robust and maintainable designs" (pp. 52–53).
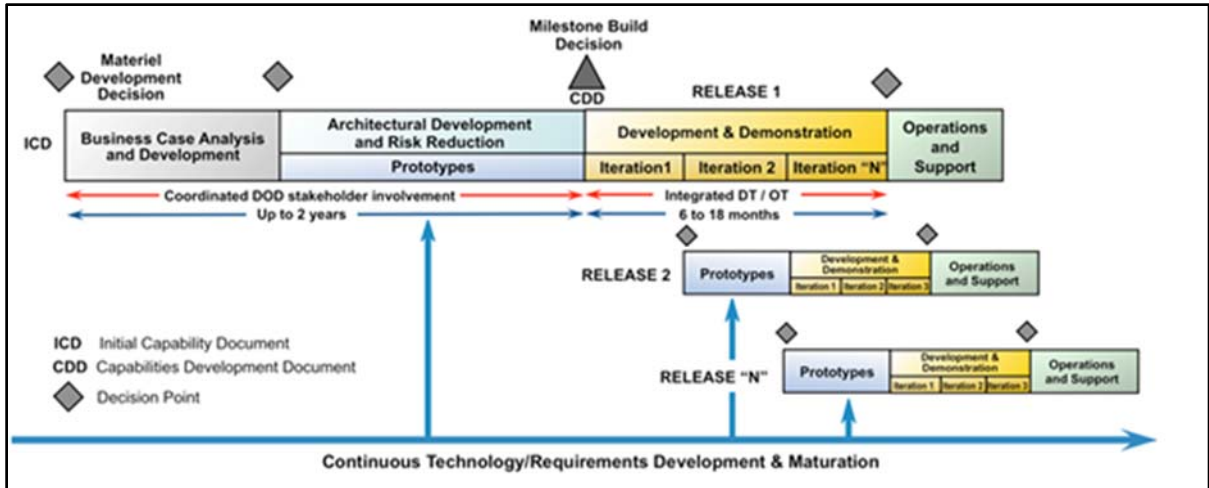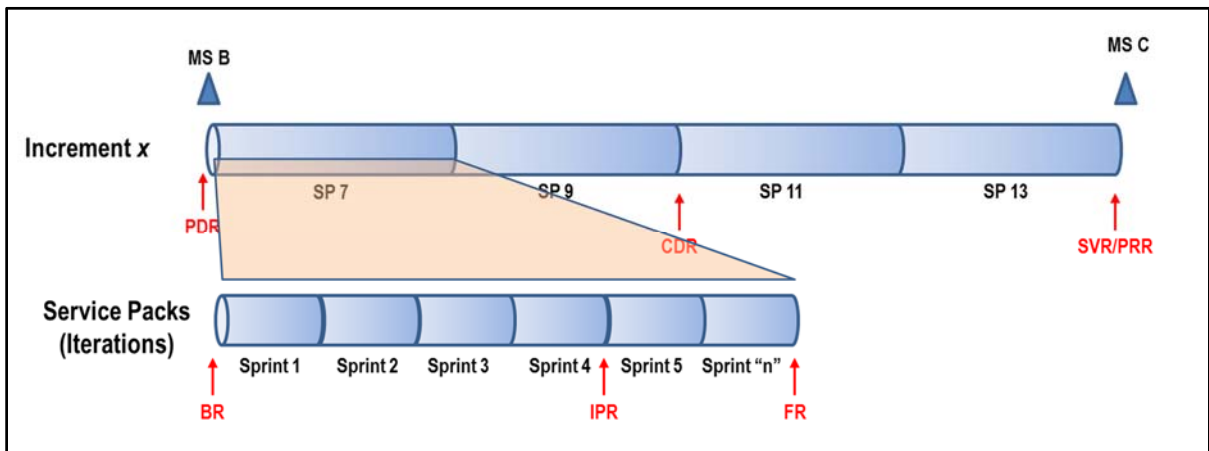
Figure 5. **New Acquisition Process for Information Technology**
(DSB Task Force, 2009, p. 48)

In the context of the primary milestone reviews (PDR, CDR, and SVR/PRR), a nominal Agile development structure was created (see Figure 6), providing increment releases (two-year cycles) that include service packs (six-month cycles of completed development efforts that have the potential to be forwarded as release candidates). Within each service pack is a series of sprints, which represent a standard form of Agile development. This construct allows the identification of a Build Review (BR; reviews are shown in red in Figure 6) at the beginning of each service pack, which addresses elements of the increment level PDR and subsequent CDR; an Interim Progress Review (IPR) at Sprint 3 or 4 to assess progress regarding cost, schedule, and performance and evaluate the service pack functional backlog compared to the current backlog, validating the detailed design of the remaining sprints; and a Fielding Review (FR) at the end of the sprint cycle. These reviews throughout the sprint/service pack cycles supplant the traditional PDR/CDR/SVR/PRR reviews and relate directly to the decision points described in the DSB Task Force's (2009) report to Congress, as shown in Figure 5.[2]

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[2] Service pack functional backlog, from an Agile development perspective, is a prioritized listing of allocated requirements (in Agile terms, stories) determined at the beginning of the sprint to be sufficient tasking to complete within the sprint cycle. The current backlog is the amount of the service pack functional backlog remaining within the sprint and is used to determine the progress against the planned effort.

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Figure 5. **New Acquisition Process for Information Technology**
(DSB Task Force, 2009, p. 48)

In the context of the primary milestone reviews (PDR, CDR, and SVR/PRR), a nominal Agile development structure was created (see Figure 6), providing increment releases (two-year cycles) that include service packs (six-month cycles of completed development efforts that have the potential to be forwarded as release candidates). Within each service pack is a series of sprints, which represent a standard form of Agile development. This construct allows the identification of a Build Review (BR; reviews are shown in red in Figure 6) at the beginning of each service pack, which addresses elements of the increment level PDR and subsequent CDR; an Interim Progress Review (IPR) at Sprint 3 or 4 to assess progress regarding cost, schedule, and performance and evaluate the service pack functional backlog compared to the current backlog, validating the detailed design of the remaining sprints; and a Fielding Review (FR) at the end of the sprint cycle. These reviews throughout the sprint/service pack cycles supplant the traditional PDR/CDR/SVR/PRR reviews and relate directly to the decision points described in the DSB Task Force's (2009) report to Congress, as shown in Figure 5.[2]

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[2] Service pack functional backlog, from an Agile development perspective, is a prioritized listing of allocated requirements (in Agile terms, stories) determined at the beginning of the sprint to be sufficient tasking to complete within the sprint cycle. The current backlog is the amount of the service pack functional backlog remaining within the sprint and is used to determine the progress against the planned effort.

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Figure 6. Linkage Between DoD Acquisition Mangaement System Reviews and Agile Development Reviews

Given the potential differences in the wide variety of program development efforts, tailoring of the reviews to best support the specific aspects of a program is necessary. This customization can, as indicated previously, be structured such that the sum of the review content is equal to the sum of the replaced reviews.

Just as the reviews themselves are being streamlined, the supporting documentation should be streamlined to eliminate unnecessary effort.

Documentation Analysis

The documentation review resulted in a comprehensive analysis that provides a high-level overview of acquisition documentation. Although it was expected, the review verified that because a program is required to increase reporting responsibilities to address statutory and regulatory requirements, opportunities for significant streamlining are greatly reduced. This is particularly true for Major Defense Acquisition Programs (MDAPs) and Major Automated Information Systems (MAISs). It is the remaining programs that can benefit from a reduction in documentation associated with regulatory requirements; specifically, small software intensive development efforts. This does not preclude the use of Agile development as a component of larger projects (such as for a software development effort ancillary to a major hardware development effort), but it will require a significant amount of negotiation with the MDA.

In analyzing individual document requirements, it was apparent that aggregate generalizations regarding documentation do little to support the tailoring of a program to streamline reporting requirements other than to say that it is possible. As Lapham et al. (2010) reported,

> Those programs that have used Agile in software development have found that the DoD 5000 series has great flexibility and does not in fact preclude the use of Agile. It appears that with careful review and some tailoring an alternate interpretation can be created so that Agile can be used on DoD programs. (p. 13)

This analysis, while correct in identifying the DoD 5000 series as the prime set of regulatory hurdles with which to contend, shows that a program must also deal with additional statutory and other regulatory requirements tied to acquisition development. Even if Service-specific requirements (Secretary of the Navy instructions, Army regulations, etc.) and *Defense Acquisition Guidebook* requirements are removed, several Title 10 requirements and other regulatory requirements remain (such as Chairman of the Joint Chiefs of Staff Instruction [CJCSI] 3010.02B, 3100.01A, 3170.01H, 3312.01A, 6212.01D, and 8501.01A; DoDD 7045.20; DoDI 4650.01, 6055.1, and 7041.3; and Statement of Federal Financial Accounting Standards [SFFAS] No. 23).

The statutory/regulatory documentation breakout resulted in further decomposition to identify value-added versus negligible-value or no-value-added documentation (this was a qualitative evaluation associated nominally with a generic Agile software development effort). Many documentation requirements have little or no value in supporting a software development effort or the eventual fielding of software (such as Programmatic Environmental, Safety, and Occupational Health Evaluation, Non-Destructive Test Plan, and Unique Identification Implementation Plan, Failure Modes Effects Criticality Analysis, Performance Based Logistics Business Case Analysis, and Diminishing Manufacturing Sources and Material Shortages); in these cases, the PM should negotiate with the MDA to

remove or reduce the documentation requirement, as appropriate. There are many cases in which the value of the document to the development effort is obvious, and program management offices should identify those documents early in the program initiation phase to ensure proper planning to accommodate the necessary documentation effort.

A program's milestone reviews and documentation streamlining effort can support a project's Agile development; however, gaining MDA approval for those efforts can be problematic without some assurance that programs are still producing a quality product. RITE provides many of the necessary assurances that programs need to gain MDA approval.

RITE Analysis

As described in the background section, the RITE initiative was created out of a need to improve the ability of programs to meet cost, schedule, and performance targets of their sponsors. In adapting to the needs of Sec. 804, 2010 NDAA, RITE answers many of the concerns of PMs and MDAs regarding the rigor necessary to successfully implement an Agile development methodology.

In following the RITE process, programs use the RITE Pillars (see Figure 7) to guide their efforts in supporting an Agile development effort. RITE focuses a program's efforts on critical areas proven to be essential in successfully developing and fielding software products within cost, schedule, and performance constraints.
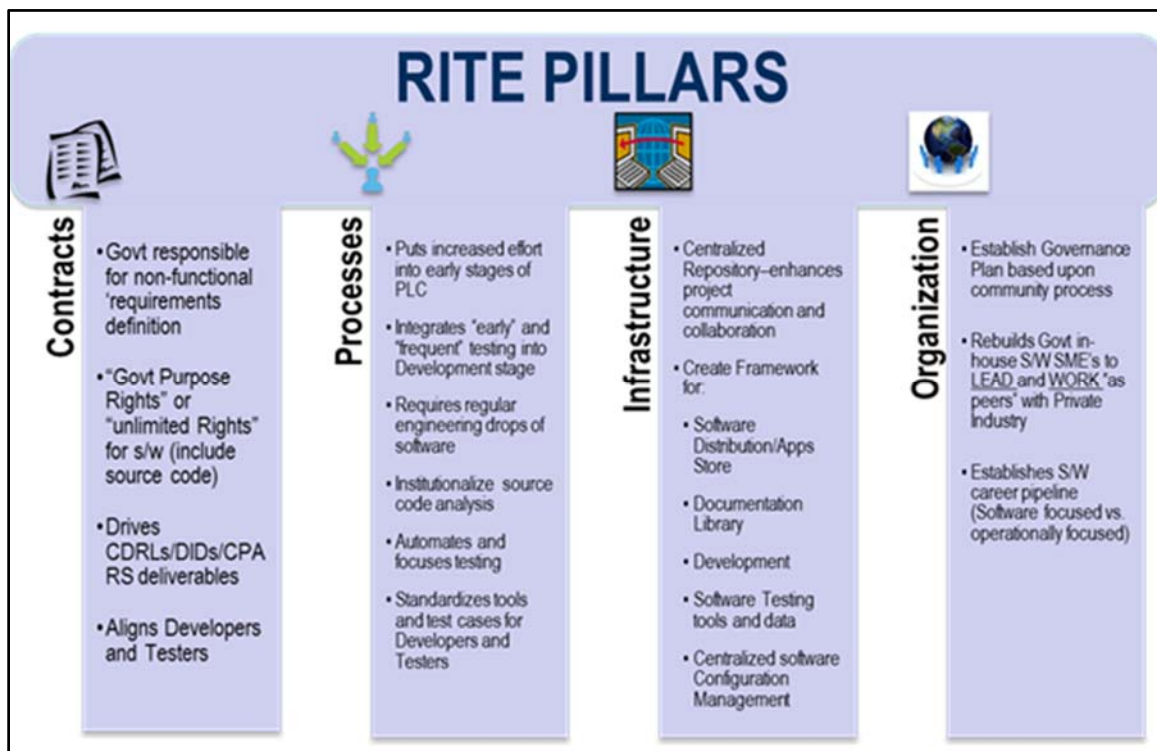

Figure 7. **RITE Pillars**

The RITE process is not, nor is it intended to be, a panacea for a program struggling with Agile development. It is intended to support Agile development and other simplified, rapid development techniques that focus on product quality and efficient development. Combining Agile development with RITE provides a program with the structured engineering practices necessary for defense acquisitions. The RITE focus on contracts is supported by

Lapham et al. (2011) in analyzing contracting issues associated with Agile development: "Due to the iterative nature of Agile and its propensity to accept (even welcome) change, many contracting vehicles present unique challenges for employing Agile methods. A particular issue is the reporting and milestone requirements often levied against DoD contracts" (p. 33).

RITE also includes focus areas for processes, infrastructure, and organization, which provide necessary supporting elements that give Agile development structure without becoming cumbersome to the development effort. The Process component of RITE puts a greater level of rigor in the development effort and provides the structure necessary to keep Agile development methods on track. The Infrastructure component of RITE provides the tools necessary to support Agile development without hindering flexibility; automating as much of the mundane record-keeping, configuration management, and test tools and data ensures that the development team stays focused on development and not on writing reports and tracking software baselines. The Organization component of RITE focuses on the teaming nature required in an Agile development environment. While it is common to have a software effort completely developed by a contractor, the RITE process has identified key areas in which government personnel support development by integrating users, developers, and the integration/test team throughout the development cycle.

Recommendations

Although the DoD response to the congressional requirement to reform the IT acquisition system referenced all the key components necessary to compel program management offices to consider Agile development methods, little is actionable from the response. The DoD must focus efforts on adapting the DoD 5000 series to address streamlined development methods and provide the regulatory authority to reduce documentation complexity while maintaining appropriate oversight. Pending a significant change to the DoD 5000 series, PMOs can still execute Agile development—but not without addressing milestone reviews, contracting, and documentation.

The milestone review process must transition from monolithic, all-encompassing reviews to smaller, frequent decision reviews focused on meeting development targets. Ensuring flexibility in the process, the reviews must accommodate changing requirements and quality development. The Office of the Deputy Secretary of Defense (2010) report to Congress provides the basic authority to execute IT programs based on this approach (pp. 9–14). The transition to frequent decision reviews must also be accompanied by a streamlined documentation effort.

Maintaining the comprehensive documentation requirements of a standard acquisition program would severely reduce the value of an Agile development. Documentation should be focused primarily on meeting the requirements of the development and sustainment effort. Secondary requirements should include statutory documentation and regulatory documentation that cannot be negotiated away. This negotiation with the MDA must be executed as early as possible in the program initiation phase as soon as documentation requirements are locked down.

Where statutory and regulatory compliance drives requirements outside the Agile development structure, PMOs should ensure that contracts address those elements while maximizing the flexibility necessary to keep Agile development as the primary criteria upon which the contract is evaluated. As Lapham et al. (2011) noted in their assessment of the value of implementing an Agile development methodology to a PMO, engagement above the PMO level is necessary (including the need for waivers, mainly from the MDA) to address the departure from DoDI 5000.02 requirements:

> For example, a PMO that embraces the Agile principle that values operating code over extensive documentation may require a different set of CDRLs when formulating a contract. This not only requires a change in perspective, but also the creation of appropriate governance models, via tailoring DoD 5000.02 and CDRLs from such events as SRR, PDR, CDR, etc. The PMO involved may have to seek waivers from higher up the acquisition chain, and these higher-ups must also understand Agile methods if they are to understand what they are waiving. One of our reviewers cited a recent contract using Agile methods, in which they were bounded by an SDR milestone, but obtained approval to have IDRs (Incremental Design Reviews) beyond that time instead of the traditional PDR and CDR cycle. (p. 24)

PMOs supporting an Agile development effort must work closely with their respective TA to identify and plan a successful acquisition strategy that leverages the best of Agile methods while maintaining the oversight necessary to ensure that a quality product is delivered within cost, schedule, and performance parameters. The PM and TA must present a unified front in gaining approval from the MDA. The TA, providing the institutional backing for Agile development, should champion the effort, while the PM provides program specific details that support the program's streamlining requests.

This interaction between the PM and MDA is essential to the success of any Agile development effort absent significant changes to current acquisition regulations to address the Sec. 804, 2010 NDAA requirements. Implementation of RITE, within the context of an acquisition program's Agile development effort, will assist PMOs in validating and ensuring compliance with critical acquisition elements, which is essential to garner the support of the MDA. RITE is an Agile enabler for the government.

Conclusion

The analysis regarding the effort necessary to streamline a program's milestone reviews and documentation requirements confirm previous research regarding the applicability of Agile development within a DoD acquisition environment. These results require an up-front investment in time and effort to produce a meaningful reduction in the milestone review and documentation effort. PM engagement with the MDA, in concert with the TA, is essential in gaining the approvals necessary to support Agile development. The use of the RITE process supports the PM's objective of creating a structured environment that remains conducive to Agile development and provides the MDA with the comfort level needed for approval of a streamlined milestone review and documentation effort.

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Acknowledgements