DoD Agile Adoption:

Necessary Considerations, Concerns, and Changes

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Abstract. Today's DoD acquisition environment relies on the DoD 5000 series of guidelines. Nothing in the DoD 5000 series precludes the use of Agile methods. In fact, Agile methods provide both tactical and strategic benefits. However, achieving these benefits is not likely to occur without changes to the traditional DoD mindset.

Introduction

This article summarizes the SEI Acquisition Support Program's exploration of using Agile approaches in software-intensive systems developed or being developed in the DoD. Our work to date has been to provide prudent, pragmatic advocacy of Agile methods for those within DoD who want or have to implement those methods. We have identified issues and challenges to overcome when implementing Agile in a DoD environment. These issues and challenges are summarized herein.

For purposes of this article, Agile is defined as: Agile: An iterative and incremental (evolutionary) approach to software development which is performed in a highly collaborative manner by self-organizing teams within an effective governance framework with "just enough" ceremony that produces high-quality software in a cost effective and timely manner which meets the changing needs of its stakeholders.[1]

Further, the terms "Agile methods" or "Agile approaches" are commonly used throughout to characterize a set of disciplined incremental methods that involve strong, continuous end-user collaboration, frequent (two to four week) work in progress deliveries, and techniques such as continuous integration and test-driven development. Although all Agile methods are incremental, not all incremental methods reflect Agile properties.

Since the SEI work began, there has been considerable movement within the government and DoD to identify and implement a new acquisition process that can take advantage of Agile methods. Attachment 2 of the "804 report" [1] provides Interim Acquisition Guidance for Defense Business Systems.

Our review of the DoD 5000 series showed that there are no interpretations that directly preclude or limit the use of Agile methods within the DoD. There are some constraints, challenges, and even some supportive instances within the policy and instruction. Agile methods, "Can provide both tactical and strategic benefits. The tactical benefits of lower cost within schedule and increasing quality are important; however, the strategic benefits of being responsive and being able to adjust to the current situation more rapidly might be of even greater value [2]. This could be a huge factor in today's world, where the DoD needs to get results faster and be better aligned with changing needs" [3].

Policies, regulations and other governing documents aside, there are underlying concerns that will form the basis for adopting Agile within the DoD. The main difference between using Agile and a more traditional method is the requirement for different management and technical approaches if the advantages of Agile are to be fully realized. In addition, the Program Management Office (PMO) needs to determine how proficient it will be at organizational change [4].

Potential Barriers and/or Differences From Traditional Methods

Interviews with several DoD programs that are using or have used Agile methods combined with a review of relevant literature revealed some of the areas where barriers and/or differences from traditional methods are encountered [3]:

- Acquisition lifecycle: Some lifecycle phases lend themselves to the use of Agile better than others. Remember to consider Agile processes and so that contractually binding documents, such as the request for proposals, and statement of work, support those processes and practices. One particular stumbling block for the adoption of Agile tends to be capstone technical review events such as preliminary design review and critical design review. Agile methods typically do not produce the types of documentation expected at these milestones. Instead, they provide working prototypes and, in some cases, a subset of requirements implemented as usable software. Therefore, expectations and criteria for acceptance need to be established at the beginning of the contract that meet both the contractual needs and allow for the use of Agile methods. Since Agile produces the final product iteratively, the expectations and criteria for acceptance need to be compatible.
- Team environment: A central concept to Agile is the small, dynamic, high-performing cross-functional team (or teams depending on the size of the program). Testing is done concurrently within the team with continuous integration [5]. The teams expect input from the end users throughout this process. Each team usually conducts regular reflection and adaption called retrospectives. The government team needs to understand and support this way of doing business. Otherwise, using Agile will have less than optimal results.
- End-user access and involvement: One of the key tenets stated in the Agile Manifesto, the document that, since 2000, has guided adopters of Agile approaches, is "Customer Collaboration over Contract Negotiation."[2] This is usually accomplished by having continuous contact with the end

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14. ABSTRACT
Today?s DoD acquisition environment relies on the DoD 5000 series of guidelines. Nothing in the DoD 5000 series precludes the use of Agile methods. In fact, Agile methods provide both tactical and strategic benefits. However, achieving these benefits is not likely to occur without changes to the traditional DoD mindset.

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user. In many instances, the end user is an integral member of the iteration team. This is not always practical in the DoD environment, especially with joint programs and the myriad of stakeholders DoD software-reliant systems serve. In addition, the real end user is an operational person who may not have any experience in the acquisition career field while the acquirer may or may not have operational experience. The contractor and government usually solve this problem by agreeing on a proxy for the end users' day-to-day interaction and inviting end users to all demos. This end user interaction is important in successful projects using Agile [6].

• Training and coaching to provide knowledge of Agile: Many of the Agile concepts are not new, but the subtleties and nuances of each Agile method can be new to the uninformed. To overcome this, all PMO staff should be trained in the contractor's method of choice [3]. It is important to set aside funding for initial and ongoing training and support. Without the requisite training, misunderstandings will certainly occur and could have disastrous consequences. A coach and/or an Agile advocate who has "clout" within the PMO is a good addition to the PMO staff. Their presence can answer daily questions, help resolve issues before they become problems and help to ensure the program runs smoothly from an Agile perspective. The Agile advocate/ coach must have authority; otherwise they will get lost in the chorus of voices demanding to be heard.

• Oversight including milestone reviews, documentation, and evaluation (metrics): Traditionally, the government uses milestone reviews, documentation, and evaluation metrics to monitor and evaluate contractor progress on and/or review specific aspects of the proposed technical software solution [7]. Typically, the expectations and criteria for milestone reviews and documentation are negotiated at contract award and certainly well before the milestone event occurs [8]. This practice is not different for programs using Agile methods. However, documentation for an Agile program is just enough to meet the minimal set of technical and programmatic needs and provide continuity for the team. This type of documentation is not usually enough for capstone events. Thus, the negotiations need to determine what is acceptable for the program and yet will work within the Agile environment. Tailoring typically takes on additional importance. Some keys that are useful in assuring that the ultimate outcome is achieved:

* Confirm all parties have a stake in the outcome or as the Defense Science Board has stated have some "skin in the game" [9].

* Determine how regulatory documentation that does not necessarily contribute directly to development activities will be created.

* Agree to the intent and content of each artifact.

* Make sure all requirements levied by guiding instructions, directives, etc are expressly met.

One analogy for oversight within the Agile community could be what the military calls "Commander's intent." Commander's intent provides a clear, concise, and focused statement of intent. Thus, the mission can continue, even if the operation does not go as planned [10]. For Agile, the overall plan is the intent. If the plan does not work as expected, the development team alters the plan with the intent in mind. This requires trust, collaboration and relationship building, which are core ideas for Agile. Performing Agile implementations requires that the oversight method, documentation, and form of metrics be thoroughly negotiated and agreed upon in advance of starting the program. When doing this negotiation, keep in mind that less formal does not mean undisciplined. Agile programs tend to be less formal, but highly disciplined.

• Rewards and incentives: Rewards and incentives for Agile teams focus on the team. This seems to be contrary to the traditional individual based reward system in place on most programs where the "hero" gets the award. Unless the government is doing internal development, the majority of change in this reward model is left to the contractor. However, the government can assist by considering incentives that embrace and foster change and sharing of data. "Personnel need to be incented to do significant adoption of planning and strategy for the technology shift and related business, legal, and operational aspects" [3].

• Team composition: The team composition for Agile developers is different than on traditional teams. Thus, the government should consider that their team will also have a different composition. Two important positions that are new to most government teams are those of Agile advocate and end-user representative. An Agile advocate, as described in Training and coaching above, provides real-time answers to immediate Agile issues for the government team. The end-user representative not only needs to represent the end users, but must have the authority (within delegated limits) to direct the contractor. Without skills in modern software development approaches, the government program office may have issues with oversight, which are quickly visible in the fast paced Agile world.

• Culture: Culture is the customary knowledge, beliefs, behavior, and traits displayed by an acquisition organization or contractor [3]. A brief comparison of some typical cultural elements is shown in Table 1. The same elements can have significantly different instantiations depending on the method employed [8].

"Traditional project managers focus on following the plan with minimal change but the Agile manager focuses on adapting successfully to inevitable change" [4].

This illustrates two very different mindsets. If the government is serious about adapting Agile methods, then they will have to modify their mindset so that they view software lifecycles from other perspectives than the traditional metaphor [11]. This will not be easy and does not mean traditional methods should be totally abandoned. The culture change needs to provide flexibility so that traditional and Agile methods can be employed when and where needed. Neither method provides a solution to all problems.

For example, one possible action that could be taken to bring change to the rewards system is to make some or all rewards team based. Rewards can be other than monetary, such as choice of assignment, mentoring, training, etc. Downplaying merit increases and associating career accomplishments and

Element	Agile DoD	Traditional DoD
Organizational Structure	• Flexible and adaptive structures; • Self organizing teams, • Co located teams or strong communication mechanisms when teams are distributed	• Command and control structures that are difficult to change • Hierarchical, command and control-based teams
Rewards System	• Team is focus of rewards • Sometimes team itself recognizes individuals	• Individual is focus of the reward system
Communications & Decision Making	• Daily stand up meetings, • Frequent retrospectives, • Information radiators[5] to communicate critical project information; • Evocative documents to feed conversation; • "Just enough" documentation. • Control and discipline comes from the Agile team itself.	• Top down communication; External regulations, policies and procedures tend to drive the work. Activities and processes documented; • Traditional, representational documents used by the PMO throughout the development life cycle to oversee the progress and discipline of the developer through formal and informal reviews.
Staffing Model	• Cross functional teams including all roles across the life cycle throughout the lifespan of the project; • Agile advocate or coach • End-user representative	• Uses traditional waterfall model with separate teams, particularly for development and testing • Different roles (e.g. developer, tester) are active at different defined points in the life cycle and are not substantively involved except at those times

Table 1. Comparison of Some Agile and Traditional DoD Cultural Elements

milestones with promotions is one strategy. Another strategy is to let the team naturally recognize its heroes and include an appreciation step during your retrospective [8].

A final word about culture. There is a big difference between doing Agile and being Agile. Picking an Agile process and following it step by step without fully embracing the culture can provide some benefit. However, if being Agile is the goal, then a culture of agility needs to be created [12]. The culture goes beyond using an Agile software delivery process, it seeks to change what the team values, measures, and delivers (i.e., placing value on collaboration and personal interactions, working software and adjustment to change) [8].

• Integration and test: Continuous integration and test of some form is done within Agile teams. This is contrary to the traditional approach where integration is done at the end of a release cycle. If final integration and test is being used for system acceptance, then most likely an independent external team will conduct the work. However, the continuous integration and test during the development using Agile methods should mean that there are less risks to be overcome as more issues will have been found earlier in the lifecycle. Additionally, there should be less risk of user rejection since testing by the Agile teams puts validation before verification through the involvement of the user.

• Managing Agile programs: The Agile approach to project execution places demands upon all personnel that are still traditional but it also differs from other execution environments. The managerial role is uniquely affected by the features of the Agile approach. Both the acquiring-side and execution-side[3] managers become leaders, coaches, expeditors, and champions.[4] As a leader, the executing manager needs to spend more time with the team to help create a "trust factor" so that delegating important tasks can easily be accomplished. The acquiring manager needs to determine who to designate as the on-site representative to maintain adequate visibility into the fast emerging product.

As a coach, both managers need to assist their personnel in making the transition to the fast tempo, high interaction environment that typifies Agile projects. This is often accomplished by including someone who has the role of Agile coach for the project. As an expeditor, the executing manager

needs to identify and quickly remove any organizational and operational impediments. The acquiring manager needs to secure appropriate status information without unduly interfering with the tempo of Agile development using negotiation and establishing trust with the executing manager. As a champion, the executing manager will need to translate the unfamiliar, if not foreign, Agile model for the upper-level management and other managerial stakeholders. In addition to this, the acquisition manager will have to maintain buy-in by external funders and stakeholders. This will include providing a portrayal of project status and accomplishments that is accurate as well as bridging the cultural gap that exists.

Road to Agile Adoption

During our interviews, the two main reasons within the DoD for moving to Agile are a burning platform (i.e., if the program does not change its current development practice to improve outcomes, it is likely to get cancelled); and urgency of delivery, i.e., an operational need that cannot wait for traditional delivery times is mission-critical enough to warrant a different acquisition approach [8].

We also found a third, perhaps more compelling reason to move to Agile methods. Section 804 of the National Defense Authorization Act for Fiscal Year 2010 specifies that information technology systems, "be designed to include (A) early and continual involvement of the user; (B) multiple rapidly executed increments or releases of capability; (C) early, successive prototyping to support an evolutionary approach; and D) a modular open-systems approach" [1]. The fact that Agile methods are more compatible "out of the box" with all four of these directives than typical IT acquisition practices is an encouraging sign that appropriate use of these methods in the future will be supported.

For those who have been using Agile methods for some time, some common themes that characterized continuing motivation for change included:

- A sense of true accomplishment when they delivered a release that they knew incorporated functionality the end user needed.
- A short time span for seeing the differences their work made to their end users.
- Encouraging (often laudatory) user feedback that clearly communicated the value of their approach.
- Consistent ability to meet or exceed user expectations.
- Previous inability to deliver value within agreed timespans and costs.

In order to adopt Agile methods, best practices in adoption and organizational change management need to be considered. Some of these topics are:

- Understanding your adopter population: [13] By this we mean understand the characteristics of the people both as individuals and as a group. For those in the DoD who have adopted Agile methods, they have been pathfinders in terms of finding ways to "work Agile" in an environment that demands artifacts and evidence based on "working traditional." Successful adoption across a wide spectrum of appropriate DoD programs will not occur until more communication and implementation support mechanisms are available [14].
- Understanding the cycle of change: Change takes effort and time [15]. From our interviews, it was common to phase adoption of Agile methods over a period of time to allow the staff to get accustomed to a new set of practices.
- Understanding your adoption risks: Know where you are in terms of practices, skills, sponsorship, and values. The adoption approach used by the majority of programs interviewed heavily leveraged external training and coaching [16].
- Building transition mechanisms to mitigate adoption risks: Some potential mechanisms are articles in CrossTalk, Defense Acquisition News, etc. on programs successfully using Agile methods and conference tracks and workshops that highlight the benefits and risks associated with adopting Agile practices [17].

Conclusion

Agile methods can provide the benefits of being responsive and being able to adjust to the current situation faster than when using traditional methods. Adopting Agile methods is not without work to overcome barriers. Others have done so and there is a wealth of information starting to accumulate to assist organizations wanting to make this change. The authors of the two papers summarized here are continuing to research this arena and add to the body of knowledge available for DoD use.

Disclaimer:

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NOTES

1. <http://www.agilemodeling.com/essays/agileSoftwareDevelopment.htm>
2. See <http://Agilemanifesto.org/history.html>
3. The executing-side manager could be a development contractor or part of an organic government team, such as an Air Logistics Center team
4. The common traits takes inspiration from Dean Leffingwell [5] then alters and expands them to address inserting Agile practices into DoD acquisition.
5. Information radiator – is a large, highly visible display used by software development teams to track progress. The term was first coined by Alistar Cockburn. See <http://www.atlassian.com/wallboards/information-radiators.jsp>

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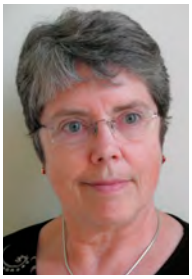

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