Terra Incognita

iterative development

Scrum

Agile XP

Lean backlogs working

prototypes

Software burndown charts

Development

The Challenges of Being Agile in DoD

William Broadus

I n today's acquisition environ-ment, it no longer is unusual for your program to award a product or service development contract in which the vendor intends to uti-lize "Agile Methods" for its software development efforts. In fact, the of-ficial push for Agile within the De-partment of Defense (DoD) came from Congress in Section 804 of the Fiscal Year 2010 National Defense Authorization Act: Implementation of New Acquisition Process for In-formation Technology Systems.

This section directed the Department to report to Congress on how DoD planned to meet the intent of the law. The key elements of the response from the Office of the Secretary of Defense ("A New Approach for Deliver-ing Information Technology Capabilities in the Department of Defense,"

Broadus *is a professor of engineering and program management within the Mid-Atlantic Region of the Defense Acquisition University. He is a Marine Corps veteran, adjunct profes-sor for Johns-Hopkins University, and former U.S. Naval Air Systems Command Deputy Program Manager.*

November 2010) focused on the following: (1) Deliver Early and Often, (2) Incremental and Iterative Development and Testing, (3) Rationalized Requirements, and (4) Flexible/Tailored Processes (see Figure 1). Also, both the DoD Chief Information Officer in the Department's modernization plans and the White House CIO in the FY 2013 budget priorities clearly identify the government's need to establish processes and "agile teams" to achieve secure, efficient, and effective IT for DoD.

For most programs, using Agile is approaching new territory, full of unfamiliar processes, lacking clear alignment to existing expectations, and/or one in which program stakeholders are unprepared to adapt to their changing roles. As is illustrated in Figure 2, researchers reviewing Agile projects and programs within the DoD environment have identified a number of key barriers that could create major challenges to achieving successful outcomes. Unsurprisingly, these challenges are rooted in the differences between the traditional acquisition methods of DoD and those practiced within the Agile community. Programs intent upon success must realize that the benefits of Agile can be achieved in the DoD environment only through thoughtful planning, preparation, and implementation focused on acknowledging differences, adapting to the new methodologies, and not expecting the Agile approach to fit into an "acquisition development box." As one expert in the field stated, ". . . to become Agile is to migrate from Work Breakdown Structures (WBSs) to backlogs and from Gantt charts to burndown charts."
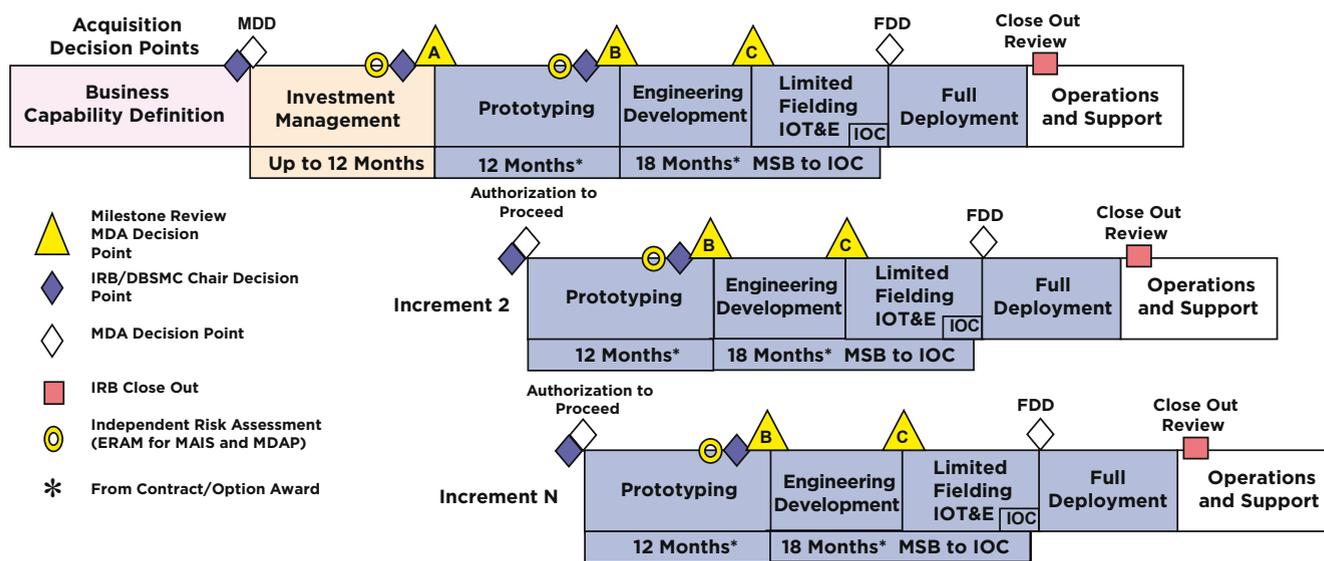
Multiple studies of the DoD 5000 series by organizations familiar with DoD acquisition and Agile Methodologies have concluded there are no direct policy or practice issues that would preclude or limit the use of Agile methods within the DoD. A very important conclusion of these studies on Agile methods is that they can provide both tactical and strategic benefits for the organization. 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.

Adopting Agile within the DoD still presents a number of concerns even with the additional direction provided by recent policies and statutory changes. The key challenge, which will be addressed from numerous perspectives in this article, is how to implement a new set of management and technical approaches necessary for the advantages of Agile to be fully leveraged.

Agile in Context
In this article, the term "Agile" will serve as an overarching term to represent all forms of iterative development whether Scrum, Lean Software Development, extreme programming (XP), or others. The discussion will focus on the common root cause challenges and not the unique, specific details of the various methodologies. The idea for "Agile" began 12 years ago when a small group of software gurus brought forth the

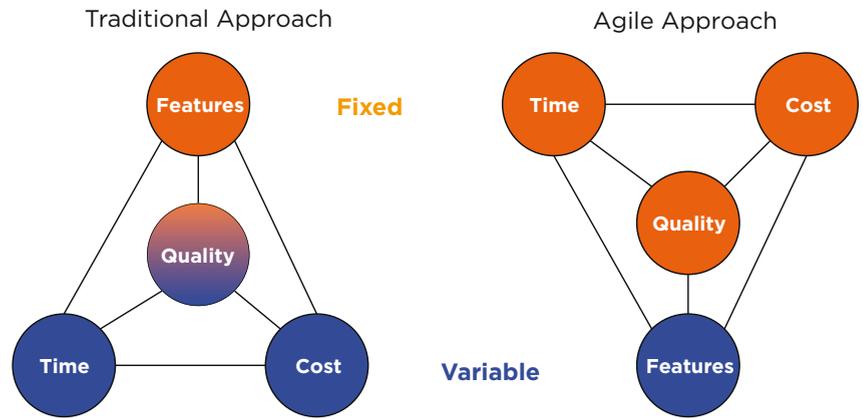## Figure 1. Business Capability Lifecycle Acquisition Business Model*

Guiding Principles:
• Deliver early and often
• Incremental and iterative development and testing
• Rationalized requirements
• Flexible/tailored processes
• Knowledgeable and experienced IT Workforce

Key Attributes:
• Streamlined capability documentation
• Streamlined governance and tiered accountability
• Independent risk assessment
• Flexibility in capability implementation strategies
• Emphasis on the use of mature technologies
• Use of "time constrained" process management and program execution
• Capability delivery in increments of 18 months or less
• User and test communities engagement throughout the life cycle

*OSD Report to Congress #13744-10, "A New Approach for Delivering Information Technology Capabilities in the Department of Defense," November 2010 (Pursuant to Section 804 of the National Defense Authorization Act for Fiscal Year 2010).

"Agile Manifesto" (2000), posing a radical approach to software development.

Agile is as much a philosophy as a modern development methodology. This philosophy focuses on value to the customer and efficiency in the approach to delivery, a key friction-point when working within the significant structure of the typical DoD program.

Agile focuses on better collaboration, satisfied customers (short-term feedback) and higher-quality software. This approach has gained significant "traction" against more traditional waterfall or "phase-gate" development processes, which are the traditional DoD planning paradigms as highlighted in Figure 3. The generally agreed-to benefits a program can achieve by incorporating Agile include:

- Ability to stay nimble and responsive to constantly changing customer needs
- Faster time to market of products (reduced cycle-time)
- Meaningful collaboration between all stakeholders

Agile requires new skills by all those involved in the process in order to be successful; development team, customers, product owners, and other stakeholders. This point and its implications will be addressed in several ways later in the article.

Questions that arise from non-Agile aligned stakeholders will include items such as:

- What are we really building? What happens to the requirements?
- How do we keep everyone in the loop when we're not in the same office for the "daily standup"? (An Agile process of

Figure 2. Approach to Project Variables

Customers tend to remember slipped dates more than they remember slipped features or functionality

daily discussions on planning and implementation activities that is significant to the development process and feedback to all involved).
- How do we control scope and communicate changes when they occur?
- How do we know what the development team will deliver at the end of the Sprint? (A basic unit of development in Scrum that lasts for "time-boxed" or restricted durations of from 24 hours to an entire month.)

Given the above context for Agile, the remaining portion of the article will identify and discuss the likely barriers and challenges a DoD program will face in embracing Agile as a both a philosophical and developmental paradigm.

Barriers and Challenges

This article will use a draw upon numerous research efforts to identify and discuss key focus points for the gov-

Figure 3. Traditional Waterfall vs. Agile

Process	Waterfall Approach	Agile Approach
Planning and Scheduling	Pert/Gantt, detailed and upfront; fix scope, estimate time, and resources	Release and iteration plans updated throughout; fix date, estimate scope
Requirements and Design	Detailed and upfront	Continuous, emergent, last responsible moment
Implementation	Code in parallel, follow plan, change control, deliver at end of phase; test afterward	Code and test; deliver incremental working software each iteration
Test/QA	Detailed test plans; test after implementation phase	Continuous integration, build, and test
Management Culture	Hierarchical and contractual, "command and control"	Servant leadership, collaboration, flat organization
Measures of Success	Conformance to plan or contract	Working software, satisfied customers and team

Adapted from: Leffingwell, D., *Scaling Software Agility,* Addison-Wesley, 2007.

ernment and vendor team to consider in incorporating Agile methods into their overall acquisition strategy and programmatic approach.

The DoD Life Cycle and Major Events

Some of the DoD life-cycle phases lend themselves to the use of Agile methods better than others. It is important to plan on how you will include Agile processes into your contractually binding documents (request for proposals, statements of objective or work, etc.) to achieve the benefits of those processes and practices. An area where this planning is most critical is setting proper expectations around technical review events such as the Preliminary and Critical

Agile Knowledge and Training

The concepts of Agile are based upon sound practices for software development and therefore are not new in nature. This drives a demand for training for all the government program office as appropriate for their role. Support for this will require both upfront and ongoing planning and resources. Vendors may also need to take part in some of this training in order to understand how to improve the interface between their Agile approaches and the government's management systems. Having an "Agile advocate" on the government program team who is empowered to work with both the government and vendor teams is considered a best practice.

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Design Reviews (PDRs and CDRs). Agile methods do not deliver the types of supporting documentation expected at these events. They do deliver working prototypes that may provide for a subset of stated requirements in the form of usable software. Clearly, the expectations and criteria for acceptance will need to be established and reflected in the contract language. The primary point is that Agile produces the final product iteratively, and this will require managing expectations related to acceptance and decision-making activities to ensure compatible outcomes.

Your Team Environment

A central concept to Agile methods is the use of small, focused, cross-functional teams. As a practice, testing is done concurrently with the development and iteration efforts. This requires significant access to the end users (or likely their designated representatives) throughout this process. This will require the members of the government team (the end-user representatives) to understand and participate in this significantly more hands-on approach to development.

"End-User" Access and Involvement

A key tenet of the "Agile Manifesto" is the concept of "Customer Collaboration over Contract Negotiation." The primary way this is accomplished is through continuous contact between the Agile development team and the end user. This requires the government and vendor to agree upon an appropriate proxy who will be the voice of the end user in their daily interactions with the Agile team. This practice will require the program office to plan and conduct ongoing activities that are, fundamentally, tailored Early Operational Assessments (EOAs).

Balancing Stakeholder Insight/Oversight

DoD programs rely heavily upon milestone reviews, documents, reports, and selected metrics to monitor and assess vendor progress and/or assess aspects of the proposed technical solution.

Agile methods use a similar process. However, the documentation generated for Agile is tailored to meet the minimum necessary for the programmatic and technical needs of the development team. This documentation normally is insufficient to support typical DoD milestone/capstone events. During the proposal and negotiation processes, what is acceptable for the program and will work with the Agile environment needs to be determined and captured in the contract. The tailoring process to meet this need should focus on:

- Confirming that all participants are truly program stakeholders and are committed to achieving the contract outcomes
- Establishing how all regulatory and policy documentation that does not directly contribute to Agile will be developed
- Reaching clear agreement on the intent and content of all contract elements
- Achieving all the nontechnical requirements placed upon the program

The analogy frequently used to explain oversight within the Agile community originated with military leaders in the field and is called "Commander's Intent." With Agile, it is all about the intent when it comes to planning. If the plan does not work as expected, the team will alter its plans while clearly keeping the original intent in mind. Agile programs tend to be

less formal contractually, but are highly disciplined in process and practice.

Team Composition

Agile development team composition is different than traditional development teams. In this case, the government program team needs to flex toward the vendor and strongly consider changing its composition. The two positions that would be necessary to add to the government team are the Agile Advocate and the end-user representative. The end-user representative must represent the software/system user's perspective but also have the technical authority from the Procurement Contracting Officer to direct contractor activities within specific limits. Both these key government team positions require that those serving in them possess skills in modern software development approaches associated with Agile as well as knowledge and application of best acquisition practices. Staffing these two roles likely will be one of the most difficult challenges for the government to overcome.

Shifting Cultures

All organizations have a culture based upon their knowledge, beliefs, displayed behaviors, and traits. In the traditional DoD organization, the focus is on following the plan with minimal change. In Agile, the focus is on adapting successfully to inevitable change. The goal is not just to "do Agile" but to "be Agile." Simply utilizing an Agile process, and following each step dutifully, will yield some benefit. However, if being Agile is the goal, "a culture of agility" needs to be created.

Integration and Test

Agile uses a significantly different approach to integration and testing than is employed in most DoD development programs. In Agile, integration and test are continuous activities, contrary to the traditional approach where they are completed at the end of a release cycle. This does not negate the need to have an independent external team conduct a system assessment for effectiveness or suitability as is done in Operational Testing. What this continuous integration and test approach does promote is a reduction in the risk as more issues are identified earlier in the life cycle. Since Agile puts the activity of validation (involvement of the end-user representative) before the activity of verification, there is less risk that the end user will not accept the product upon delivery.

Conclusions and Summary

Currently within DoD there are three main reasons programs are shifting toward an Agile approach to development: insufficient progress and performance using the traditional model, inability to provide urgent responses to evolving mission needs, and the advent of Section 804 of the National Defense Authorization Act for Fiscal Year 2010. In the case of Section 804, there are four directives on evolving the design approach for software information systems: (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. Agile methods are very compatible with achieving all four of these directives much more than traditional acquisition practices.

Observations gathered from government teams that have already begun embracing Agile methods in their programs have identified several very encouraging common themes. These include:

- Increased sense of accomplishment for delivered releases due to clear alignment to user needs
- Shorter time between initiation and delivery to the end users
- Positive user feedback that clearly highlighted the value of Agile approach
- Consistent and predictable ability to meet end-user expectations
- Prior inability to deliver above values with previous approaches

Upon reviewing the research on successes and issues associated with adopting Agile methods and the organizational change management necessary to implement them, the following are offered as an initial set of "takeaways" for the planning process by the government team:

- Understand your "adopters": Determine the characteristics of the individuals and the group who will be affected by moving to Agile methods. The key to success is understanding how to work on Agile in a traditional environment.
- Allow the time for change to work: Consider the time necessary to implement your Agile approach and don't be unrealistic with your schedule. Consider adopting an iterative approach to rolling out your Agile methods and identifying the key roles of Agile Advocate and end user representatives.
- Understand the risks associated with adopting Agile: Focus is on the knowledge, skills, and practices of the involved stakeholders. Consider leaning heavily on external training and coaching to mitigate your risk in this area.

Implementing Agile methods in your government program can provide the benefits of being responsive and able to adjust more rapidly to changes in the current environment than when relying upon more traditional methods. A government team must overcome significant challenges and barriers to effectively adopt Agile. These include dealing with the demands of the acquisition life cycle, assessing and addressing the composition and training needs of the team, understanding clearly the needs of the end user, effectively satisfying the needs of stakeholders related to programmatic insights, effectively integrating multiple testing approaches, as well as exercising the management and leadership necessary to drive culture change while building team trust. Agile implementation requires a significant undertaking but holds the potential for significant positive future outcomes for your team.

The author can be contacted at **william.broadus@dau.mil**.