Acquisition Best Practices to Procure Agile IT Services

Emerging Technology Shared Interest Group (SIG)

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The traditional approach to federal acquisition requires comprehensive documentation, including a detailed description of requirements and deliverables well before the inception of a project. This is perceived to reduce the risk associated with a high level of uncertainty in software development projects.

Increasingly, however, best practices in modern software development projects call for an Agile approach to developing software. Agile development methodology focuses on the rapid creation of software using cross-functional teams and time-boxed sprints, limiting upfront design, documentation, and detailed requirements. This disconnect between traditional acquisition methods and best practices in Agile software development calls for the use of acquisition methods that better accommodate these highly effective development approaches.

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Executive Summary

Best practices in modern software development increasingly call for an Agile approach to developing software solutions. However, ongoing adoption of Agile software development methods by federal agencies is generally hindered by existing acquisition practices that assume that software is developed using the traditional waterfall approach.

Traditional waterfall development is a linear and sequential approach to software design and systems development that generally progresses through distinct phases, such as: analysis, requirements, design, development, testing, and deployment. There is an emphasis on creating extensive upfront documentation to describe the detailed and comprehensive set of requirements and technical design. The lengthy design and development timeframes of a typical waterfall project often result in slow-moving projects that struggle to adapt to changing circumstances and evolving requirements. Also, due to a testing process that typically occurs late in the waterfall development lifecycle, finding and addressing misalignment between functionality, architecture, performance, and mission requirements can result in significant cost increases and schedule delays. As a result, federal agencies often experience difficulty delivering software using waterfall methodologies, prompting the movement toward the Agile development methodology.

While progress has been made delivering Agile IT services within federal agencies, the acquisition policies, processes, and culture are not optimized to structure an acquisition to procure Agile IT services. The vast majority of federal projects that have followed an Agile methodology have transitioned from waterfall to Agile in the middle of the project and under the terms of the contract. Therefore, there are few examples of federal projects that started as Agile from inception for which the acquisition strategy was designed to achieve the benefit of the Agile approach. As a result, there is a lack of solid examples and documented best practices for acquiring Agile IT services in the Federal Government.

Twelve federal leaders who are involved in Agile IT projects across agencies including VA, DHS, DOJ, Treasury, and FDA were interviewed to uncover the acquisition challenges and identify possible solutions.

The results of the interviews are addressed in this white paper provide a starting point for a dialogue between federal acquisition professionals, IT professionals, and mission customers.

The most common challenges that emerged during the interviews have been grouped into the following six subject areas based on commonality between the challenges:

1. Knowledge of Agile principles, benefits, and risks,
2. Stakeholder ownership & decision-making,
3. Performance measurement,
4. Contract types,
5. Internal government costs, and
6. Testing and IV&V.

For a complete, detailed list of all the challenges and solutions discussed in this paper, please consult the Appendix.

Knowledge of Agile Principles, Benefits, and Risks

Challenges

Lack of Familiarity with Agile Among Acquisition Professionals

A common challenge identified in the course of the interviews was that many acquisition professionals lack knowledge and understanding of the general principles and benefits of Agile development. Since the federal acquisition process has many steps and stakeholders, a lack of understanding of Agile at any point in the acquisition process can delay or undermine a procurement before it even gets off the ground. Government-wide regulations that are designed to protect the Government and regulate contractor behavior and deliverables pose a challenge to the procurement of Agile IT services. Individuals within the procurement process without the knowledge base for understanding Agile projects may be unable to design an acquisition that procures Agile IT services from contractors.

For example, federal procurements for waterfall projects attempt to identify all the requirements for a software solution upfront and evaluate the responses from contractors based on their ability to develop a solution that meets the listed requirements. This approach is not an optimal fit when procuring Agile services because Agile methods focus on evolving and emergent requirements solicitation from customers, rather than the waterfall approach that focuses on comprehensive upfront requirements and design.

With the many stakeholders typically involved in the federal procurement process it is not enough for a single executive or individual to have knowledge of Agile for the purposes of procurement. It is necessary to educate all involved in the procurement process, such as contracting officers, about Agile development to develop foundational knowledge among acquisition professionals to better understand and evaluate Agile services for the Federal Government during the acquisition lifecycle.

Perception that Agile Equals Higher Risk

A common theme that emerged during the interviews is the perception among federal acquisition professionals that without detailed documentation defining requirements, cost, and project schedule there is an increase in risk to the overall project due to a lack of predefined controls and reviews throughout the project lifecycle. In order to manage the perceived higher risk resulting from requirements flexibility inherent in the Agile approach, there is a concern among federal acquisition professionals that the Agile approach would lead to a higher administrative “change management” burden than the traditional waterfall approach due to a lack of extensive documentation and controls.

Since the Agile approach is relatively new to federal agencies and there is little familiarity and few case studies upon which to base assumption of risk, there is a perception that the Agile approach is more risky than the waterfall approach. With waterfall, there is a level of comfort and familiarity with the processes and pitfalls. Given that the initial design phase of an Agile project results in a high-level design that is less detailed and specific with a noticeable absence of extensive upfront documentation and detailed requirements, there is uncertainty among both delivery and acquisition professionals about how to quantify and manage risk on Agile projects.

Solutions

Increase Knowledge through Educational Sessions and a Myth-Busting Campaign

To increase understanding of Agile principles, methods, and benefits among acquisition professionals, federal agencies should create educational sessions around Agile development. These sessions would discuss the principles of Agile such as the Agile Manifesto and common methods like Scrum. Education should also include the benefits of Agile, such as faster time to market for high-value functionality at lower cost, and cite case studies of success stories in federal agencies where challenges were identified and acquisition professionals provided creative solutions and prevailed. In addition, agencies should implement a Myth-Busting campaign within their own agency to address the challenges to procuring Agile IT services in the federal space. Agencies should find that the upfront investment to develop and deliver educational sessions will yield improved outcomes for future Agile IT service procurements.

Expose Acquisition Professionals to Agile Development Products

The most effective way to increase familiarity with Agile development practices is by participating in a project. Detailing acquisition professionals to participate on an Agile project provides them with a first-hand experience. If participation in the core team is impossible, exposure though participation as an external stakeholder will still familiarize someone with the principals, methods, and benefits of Agile. Learning the language of Agile, the general day-to-day operations, and the collaborative interactions between product owners, developers, testers, and other members of the cross-functional team is invaluable for acquisition professionals. This knowledge, combined with existing expertise in procurement, helps create and advance best practices for acquisition of Agile IT services. Likewise, the converse could also prove helpful: acquisition experience for project professionals. Project professionals interested in using Agile IT services could benefit from spending time learning about the regulations and processes under which acquisition professionals must operate. In summary, an appreciation of one another's point of view would help all parties understand the constraints and opportunities for creative solutions to allow for procurement of Agile IT services.

Develop Agile Procurement Coaches

Fundamentally, successful institutionalization of Agile throughout an organization is dependent upon transformation of organizational culture. Incremental change is typically achieved from the delivery side by hiring Agile coaches to guide Agile teams and keep the methods and processes aligned with Agile principles. Since the presence of Agile coaches has proven instrumental in the growth of Agile from the delivery side, it is likely that Agile procurement coaches would be equally helpful in the acquisition of Agile IT services. These coaches should have extensive knowledge of best practices in the creation of acquisition strategies specific to Agile IT services. The purpose of the coach is to institutionalize best practices in procurement, serve as an on-site advisor, act as an ambassador of the Myth-Busting campaign, and hold individuals accountable to following these best practices.

Refocus Attention on "Top 4 Risks"

In order to counter the perception that the Agile approach is higher risk than the waterfall approach, federal agencies should focus their attention to the following top four risks:

1. Implementing low priority requirements will cause delays and increase the cost of delivering the high priority requirements,
2. The Government will invest in functionality that is not embraced or used by the customer,
3. Requirements will substantially change during the course of the project and the final product will be misaligned with mission need, and
4. The system will be too architecturally complex, which increases the cost to build and maintain the system.

An Agile approach can be used to address many risks on a given program, not just the four listed above.

As identified as a common theme among the interviewees, in their experience the waterfall principles of detailed documentation and project planning along with extensive requirements and project controls do not mitigate the risks listed above. The interviewees' perception was that the waterfall approach increases the likelihood that these risks will occur.

If acquisition professionals can agree that these risks are the top four risks, then the waterfall approach does not offer a solution whereas the Agile approach does.

Risk on Agile projects is managed via four approaches:

1. Experimenting early and often, with visible and announced results to drive excitement for the "wins" and quickly kill ideas that are too complex or costly,
2. Delivering working software early and often to allow for frequent progress and performance evaluation,
3. Ongoing involvement and collaboration with a product owner who represents the interests of the end user throughout the development lifecycle, and
4. Evaluating performance based on the quality of working software deemed acceptable by the customer.

Agile executes in shorter software development cycles and delivers smaller functional packages of "working product" earlier. This allows cross-functional teams to focus on a continual, iterative process of software design, development, and testing, allowing for the delivery of high priority requirements for real-time review by and rapid feedback from the customer.

From an acquisition perspective, rather than relying on a constant cycle of gate reviews or independent verification, contractors who fail to deliver high quality working software in a rapid fashion can be quickly evaluated. In this case, risk is dramatically reduced by giving a potentially troubled project the visibility to fail fast on a small scale with time for corrective action, thereby limiting the Government's exposure to major cost outlays when issues are discovered late into the project.

Stakeholder Ownership & Decision Making

Challenges

Lack of Empowerment and Accountability

On an Agile project, the product owner, or for large projects, a product owner group led by a chief product owner is empowered to be the final decision-maker for the Agile team. They decide whether a specific developed package meets the acceptance criteria for completion. Consequently, the product owner is ultimately accountable for maximizing the value delivered to the agency by making appropriate priority and functionality trade-offs.

This approach is in contrast to a consensus-based approval method where many stakeholder groups decide whether a software package is acceptable for release based on predefined criteria or an IV&V approach, where an independent party validates the software as ready for release. This method poses several challenges for the adoption of Agile and the procurement of Agile services on Federal Government projects. Typically, federal projects are governed by consensus, which can enable a disconnect from individual accountability. This culture is antithetical to the adoption of Agile methods, as Agile accepts small-scale failures as a natural and expected consequence of building software rapidly, and seeks to mitigate these failures by rapidly improving software based on feedback.

Accountability avoidance makes it difficult to find government stakeholders willing to engage as product owners on Agile teams. Also, stakeholders are typically uncomfortable being empowered to make final decisions about a product or software release. From a delivery perspective, this makes it difficult to find product owners to lead Agile teams and approve final software releases. This challenge extends upstream to the acquisition strategy, since soliciting Agile contracts requires that an organization have professionals willing to act as product owners for key functional teams. In short, if an agency finds difficulty in finding a product owner during the procurement phase, the same difficultly will likely continue into delivery.

Lack of Commitment and Engagement

Another challenge in the federal space is that the duty of a product owner on an Agile project is usually considered a collateral duty – it is not a part of the individual's performance evaluation and therefore is not at the forefront of their concerns. As the key business representative and go-between for an Agile team, the product owner is a vital part of the success of his or her team. Without daily product owner involvement integrated in to the dynamic of the project team, it is difficult to prioritize requirements and provide rapid feedback during development.

Solutions

Identify and Empower Stakeholders Early

On an Agile project, the job of product owner is arguably the most critical role; it is imperative to identify high-performing individuals to fill these roles at the earliest possible time and documented in the project charter. Product owners need to have a strong understanding of the business objectives, an ability to identify and evaluate competing priorities, and the willingness to confidently make decisions about the end software product. Ideally, a federal organization will have identified a number of individuals with these qualities before even issuing a request

for proposals (RFP), and will empower them to make quick decisions without an excessive fear of failure or condemnation. Even before the procurement stage, product owners need to be empowered to make decisions, be comfortable with that power, and understand their responsibilities as the client representative and leader of a particular Agile team. Strong product owners bring clarity and purpose to the software development cycle, and ensure that the ultimate product meets the needs of end users and the business.

Product Owner as a Near Full-time Role

The value to be delivered by a system should be worth the cost of involving a full-time empowered product owner. If not, the agency should not be undertaking the project – the return is too low. In order to be an effective product owner, an individual needs to be integrated into the daily routine of the project team. They should attend daily meetings, offer advice and support, clarify and prioritize requirements, and act as a translator between the business and development teams. Consequently, this role is most effective as a near full-time job during the course of a project, complete with performance evaluations and support from their organization. The product owner can have other agency roles and responsibilities, but being a product owner should be their primary job function. From a procurement point of view, these roles should be identified during the creation of the acquisition strategy, with support from the highest levels of agency leadership, enabling them to hold stakeholders accountable - directly and indirectly - for the program's success. Optimally, the office of the chief information officer, program leadership, and product owner(s) would establish a memorandum of understanding (MOU) during the acquisition strategy to drive common agreement for the time commitment of the product owner(s).

Product Owner as Career Building Role

The product owner role is critical to the success of the project. The agency should make a point to include participation as a product owner into the career growth of top performing individuals, otherwise those top performers may be hesitant to become product owners. The product owner role can also be sized appropriately to align with an individual's career path. For example, an aspiring executive might be dismayed to give up being the lead for a big organization in exchange for leading a team of 10 software developers. However, that same aspiring executive could play a critical role as a mature product owner with deep business domain knowledge and leadership skills and therefore might be able to lead an entire initiative or a large number of Agile teams.

Performance Measurement

Challenges

Typical Performance Measures Do Not Measure Customer Satisfaction or Value

In a waterfall environment, performance management is accomplished by defining an extensive, detailed set of requirements and performance criteria upfront, and measuring contractor performance against these preset measures. These measurements typically occur at a series of scheduled reviews, or "gates" that evaluate project deliverables at a specific point in time. The deliverables usually reflect the project's cost, schedule, and technical

performance. In addition, these deliverables are typically captured in a performance measurement baseline which is validated during the integrated baseline review. Cost and schedule performance is usually documented in a detailed integrated master schedule and budget (planned value). Technical performance is usually documented in design documents that include blueprints, workflows, and lists of requirements as well as other detailed documentation. However, this approach has minimal tolerance for changes to requirements, and can often result in a slow turnaround due to the need to update the performance measurement baseline and technical documentation.

Counter to the waterfall approach, Agile projects place a significantly greater emphasis on working software that meets customer expectations in terms of mission critical requirements and release date. The Agile methodology also empowers the team to rapidly incorporate changes based on changing product owner requirements. In an Agile environment, the definition of "done" is a checklist of criteria that working software must satisfy in order to be deployed into production. These criteria are used by a product owner to evaluate a software demonstration for completeness. Customer satisfaction is usually considered the most effective measure of performance and working software is the best form of documentation.

However, implementing Agile for government projects presents several challenges. Major government IT investments are appropriated based on a detailed business case and are typically of longer duration, 18 months or more, with six-month releases and many simultaneous sprints per release. In addition, government investments have extensive enterprise architecture, security, and system integration requirements.

OMB embraced an iterative or Agile approach for major IT investments in their June 2012 'Contracting Guidance to Support Modular Development' paper. However, OMB also confirmed the need to develop a business case documented in an OMB Exhibit 300 as well as report performance for the investment and projects (releases). Investment and project performance is also made available to the public via the Federal IT Dashboard.

Lack of Pre-Defined Documented Standard to Define Acceptance Criteria

In an Agile development environment, acceptance criteria are defined by a product owner and other stakeholders. Certain policy and compliance issues can be anticipated such as Section 508 compliance. Certain other standards can likewise be anticipated, at least broadly. Security is such an example that can be framed by reference to applicable documents and policy but is also often subject to local customization both in terms of policy and system architecture. These criteria can be significantly less detailed than the aforementioned list of requirements used during waterfall development and are highly dependent upon the involvement and judgment of each product owner and/or SME representing a particular domain. For acquisition professionals, the subjectivity of acceptance criteria presents a challenge, since most acquisition professionals are accustomed to the detailed predefined acceptance criteria typically provided with the waterfall approach.

Solutions

Collaborate with Stakeholders, Agency Leadership, and OMB

There are a number of areas where potential complications to adopting Agile can arise, starting with legal concerns surrounding the Federal Acquisition Regulations (FAR), as well as in the evaluation of competing contractors. The less detailed nature of Agile procurements makes it more difficult to distinguish between competitors and more difficult to define the RFP evaluation criteria. The OMB paper 'Contracting Guidance to Support Modular Development' requires the implementation of an integrated program team (IPT): *"All IPT members, including those from IT and acquisition offices, should have defined roles and be part of the process, from initiation to completion."* The IPT can also play an important role as the executive steering committee by defining the business case and agency's expected value from the new system, ultimately supporting the agency to procure Agile IT services.

However, we also suggest that the IPT is not only responsible for developing the acquisition strategy but also for defining the contractor's performance criteria, based on an Agile approach. These performance criteria should be developed early in the procurement process and are a critical step towards enabling the adoption of Agile methods throughout the Federal Government. These conversations should happen during the procurement and prior to RFP release, since the resulting delivery performance criteria should be included in the RFP so that bidders understand how deliverables will be evaluated.

Focus on Core Capabilities and Iterative Documentation Development

The IPT should focus on defining the core capabilities which are required to meet the mission objective and the business value rather than specific requirements and features to be developed. Or put another way, focus on where the customer wants to end up rather than define how they are going to get there. The acquisition strategy can then develop a business case and budget based on core capabilities that allows for evolving requirements. In addition, performance measures should be defined which are based on core capabilities, yet meet OMB and FAR requirements and should be specified in the RFP or statement of work.

Documentation is one of the primary performance measures required by a waterfall project management approach and by Government's existing software development lifecycle (SDLC) methodologies. Organizations that have successfully implemented an Agile development methodology have mapped the agency's SDLC to the Agile methodology and tailored the SDLC to make the process lightweight and responsive. For example, one key document within a typical waterfall approach is the requirements traceability matrix (RTM). Several agencies have created a tailoring plan that downplays the role of the RTM, or removed it altogether, replacing the RTM with a product backlog used for sprint planning.

Unfortunately, the volume of documentation has increased over time due in large part to an expectation that the inspector general (IG) or Government Accountability Office (GAO) will request documented proof of requirements, expectations, and contractor performance. Therefore, program managers are incentivized to create an audit trail that documents minute details about the project. Concern about IG and GAO requests also causes program managers to avoid iterative documentation development, and instead creates much upfront documentation in the event that there is a need to justify aspects of the program in writing.

Adopt Suitable Cost and Schedule Performance Measures

Agile Term: Story Points

Story Points are relative measures of the complexity of a user story; how much effort is needed to implement the functionality. Typical user stories are estimated using points – 1, 3, 5, 7, 8, 10, etc.

The Agile approach typically relies on a different set of performance measures to evaluate productivity, quality, contribution to mission value, service levels, etc.

One common performance measure utilized is "burn-up" and "burn-down" charts. These charts measure the sprint team's performance delivering features, user stories, or the accomplishment of functional performance indicators such as story points. The slope of the line described in these charts is also a measure of the team's "velocity" – a measure of how much work a team can accomplish in a given timeframe.

Agile Term: Velocity

Velocity is a measure of how much work a team can accomplish in a given timeframe.

A burn-up chart shows the team's progress in completing requirements and any changes to the total number of requirements planned. It therefore shows the team's progress toward completing the release and the effect that scope changes have on this progress, and can be used for projecting when the remaining requirements will be completed or how many will be completed within the timespan of a given release. A burn-down chart is used within an iteration to show the iteration's progress. It shows the days of the iteration on the x-axis and the number of requirements remaining to be completed on the y-axis. The downward slope of the line shows the rate at which requirements are being completed versus the rate they would need to be completed to finish the work of the iteration on time.

Even when using traditional Agile performance measures such as burn-up or burn-down charts, these measures do not address the cost and schedule reporting requirements previously discussed and documented in the OMB paper '[Contracting Guidance to Support Modular Development]' for major IT investments. In addition, while burn-up and burn-down charts and velocity are useful measures of technical performance for a sprint, velocity is not additive. Velocity may also be an unreliable indicator of future team performance if the composition of Agile teams changes frequently, since velocity is a measure of a specific team's throughput. As a result, forecasts derived from velocity may not be accurate. What is required is a program performance measure that supports multiple teams performing at the same time and that rolls up to a project and/or simultaneous projects.

Agile Term: User Stories

User stories are short, simple descriptions of a feature or capability told from the perspective of an end user or customer of the system.

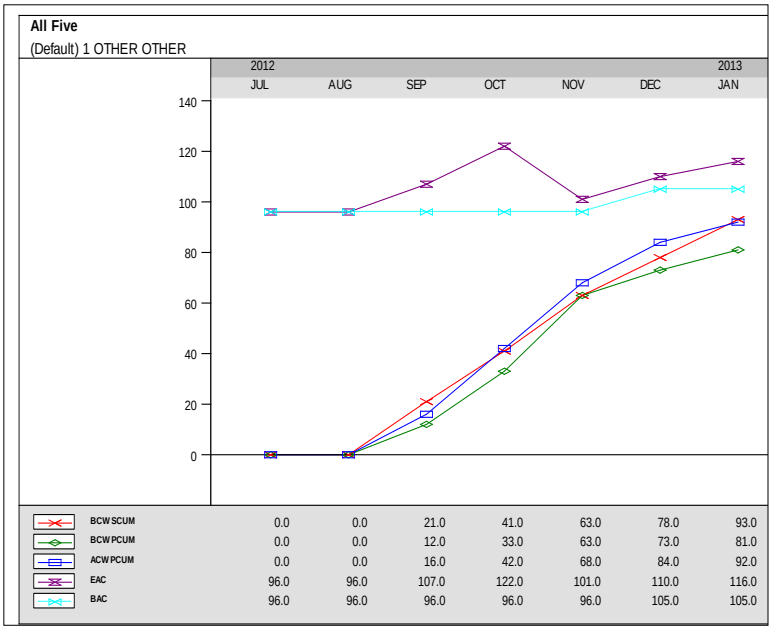
"As a user, I want to apply for a parking permit so I can park in the lot."

For major government IT investments, we suggest using burn-down charts to track sprint performance and using "Agile Earned Value Management (EVM)" to measure cost and schedule performance for projects and programs. "Traditional EVM" is rooted in a waterfall project management methodology which compares the actual amount of work performed to the original plan and schedule. In contrast, "Agile EVM" can be implemented with project control accounts based on core capabilities which span multiple sprints, with performance reporting based on the completion/implementation of

features or user stories at the end of each sprint. Sprints are typically planned at the end of the prior sprint so the prioritized product backlog of features are kept in a planning package until they are assigned to sprints. As a result, there is no impact to the budget and no traditional EVM readjustment to the baseline or change control documentation. In addition, there is no detailed work break down structure or product schedule. Sprint technical performance is already tracked for burn-down charts and team hours are recorded, so Agile EVM may be implemented with limited impact on the Agile teams. Agile EVM has been successfully implemented for several major government programs which were interviewed including at DHS, FDA, and OPM.

Agile EVM cost and schedule performance may be rolled up to the release or investment level to support OMB and agency cost and schedule project performance reporting and also supports forecasting the estimate to complete (ETC) or estimate at completion (EAC).

On the right is a sample Agile EVM chart which answers two important stakeholder questions: when will we be done and how much is it going to cost?



Sample Agile EVM Chart

Measure Quality via Customer Satisfaction

As with any software development effort, measurement of quality is equally important with an Agile approach. The customer should be pleased with the outcome, and the customer includes the both the end user and the executive steering committee that approved the project's business case. Agencies should consider establishing post-release customer satisfaction surveys and include results as a measure of quality and a feedback loop from release to release. In addition, product owners would understand that the users that they represent will be providing feedback on the design and functionality, which can help as a reminder to deliver high priority and useful functionality.

Another potential quality measure is the number and type of calls made to the help desk within a short period of time after a release. For instance, a dramatic increase in the number of help desk calls within the first few weeks after a release could indicate a component of the system that is confusing or ineffective. In addition, consistently measuring help desk calls provides a measure of technical code quality, which could help determine whether code quality is improving or deteriorating over time.

Contract Types

Challenges

The Drive towards Firm-Fixed Price (FFP) Scope Contracts

The Federal Government has gradually shifted its approach to selecting contract types, strongly encouraging agencies to employ firm-fixed price (FFP) scope contracts, as described in the OMB 2009 Memorandum 'Increasing Competition and Structuring Contracts for the Best Results', which states that *"fixed-price contracts are preferred"*. Generally speaking, FFP scope contracts are seen as placing the least amount of risk on the Government, in an effort to transfer risk to the contractor performing the work.

In the waterfall approach, this was gradually embraced because FFP scope contracts seemingly limited the liability of the Government if a waterfall project was delayed and struggled to deliver according to the original performance criteria of the contract. The Government generally believes that FFP scope contracts drive contractors towards greater alignment with agency objectives, whereas more flexible contracts such as time and materials (T&M) contracts encourage contractor behavior contrary to the Government's objectives.

Agile Term: Sprint

A Sprint is a set period of time during which specific work (features, capabilities) must to be designed, developed, tested, and made ready for review. Typically, projects complete a series of numbered sprints (sprint one, two, three, etc.) in between each release of a product.

From an Agile perspective, FFP scope contracts are problematic because they typically require the declaration of most project requirements upfront. FFP scope contracts do not accommodate evolving and emergent requirements management and do not allow flexibility to easily prioritize and assign requirements to releases as needed. Furthermore, any change in requirements on a typical FFP contract can result in expensive contract modifications and overly burdensome administrative and performance management. Therefore, FFP scope contracts are not preferred for Agile projects.

Solutions

Use T&M, CPFF, FFP LOE, and LH Contracts

With the rapidly changing nature of the initial releases of Agile projects, T&M, cost plus fixed fee (CPFF), firm fixed price level of effort (FFP LOE), and labor hour (LH) contract types can allow federal agencies and contractors the flexibility to meet the needs of Agile delivery. To help attain more predictable performance in a T&M, CPFF, FFP LOE, or LH contract, an emerging practice in government adoption of Agile IT is to declare a sprint zero, phase zero, or even a pilot wherein administrative hurdles are overcome and norms of team behaviors are established that enable the routine delivery of software.

Avoid Firm Fixed Price (FFP) Scope Contracts

Our interviewees strongly cautioned against the use of FFP scope contracts for Agile IT services due to predefined constraints for scope, schedule, and budget, and a lack of flexibility to prioritize and adapt to changing needs. In addition, FFP scope contracts may cause the

Government to pay for functionality that is low priority and infrequently used, since it that functionality was defined up front with locked scope. FFP scope contracts also force the Government to spend time and money to attempt to define comprehensive and detailed requirements so that the vendor knows precisely what to build. This time and money is better spent during the development/test cycles to provide frequent input and feedback.

Although it is not beneficial to fix the scope with Agile, it is often a leading practice to fix the time, quality, and budget to limit the Government's exposure to cost overruns and schedule slippage. In this scenario, the Government would prioritize scope aligned with what can be accomplished in a fixed timeframe and budget.

Internal Government Costs

Challenge

Difficulty Accounting for All Government Costs

Many federal agencies assume that the traditional waterfall practices using extensive upfront documentation and detailed requirements ultimately lessen the overall administrative and internal costs of managing change over the life of the project. In addition, most federal agencies do not track and account for internal costs, such as contract administration, document creation, review and approvals, and performance management. In reality, such costs are considerable on waterfall-based projects due to the high levels of documentation and rigidity of change and contract management. Such costs are not typically factored into decisions about contract type (e.g., FFP versus T&M) and approach (e.g., waterfall versus Agile).

Another widely held misconception is that as contract flexibility increases the associated administrative burden also grows in order to keep up with and manage change. In reality, since Agile does not prescribe any predefined requirements or documentation, there is little change to manage or document. No contract actions are needed because flexibility for emergent and evolving requirements is already expected with Agile. Therefore, Agile projects should involve significantly less internal costs when compared to waterfall projects. However, unless federal agencies identify and account for all internal costs, it will be difficult to use the reduced internal cost as justification for using the Agile approach.

Solutions

Identify, Track, and Quantify Internal Government Costs

Federal agencies considering the Agile approach should identify the actual costs of contract administration, document creation, review and approvals, and performance management for waterfall-based projects. By doing so, these agencies may discover a high internal government cost structure and more easily justify moving towards the Agile approach. Ultimately, however, the objective of Agile is to "go lean" and avoid unnecessary administrative functions, so any effort to track actual costs should be short and low-effort.

Address the Myth of Administrative Burden on Flexible Projects

Agile projects place significantly less administrative burden on the Government for several key reasons. First, the emphasis on working software over documentation decreases or eliminates the need for extensive document reviews. And second, the expectation of change within an Agile environment dramatically reduces the time spent on upfront design and detailing of requirements.

Testing and IV&V

Challenge

Approach to IV&V May Add Unnecessary Cost

Independent verification and validation (IV&V) has long been a staple of projects in the Federal Government. Traditionally, IV&V is viewed as a way to test and validate that a project is fulfilling the original requirements. As noted from the interviews with the Government leaders, from their experience in a typical waterfall environment, IV&V often occurs towards the end of the software development cycle, after a large portion of a software solution has been developed. This poses several problems. First, if any critical issues are identified, implementing possible solutions can be more problematic due to the complexity of a developed solution. Second, without context, it can be difficult for testers to correctly interpret requirements, spot errors or bugs, and propose effective solutions. Third, given this lack of familiarity and context, IV&V processes often necessitate that a predefined set of expected system outcomes can be written down in detailed documentation that can be compared to the actual system.

As a result, the traditional approach to IV&V relies on predictable outcomes that are defined and documented at the beginning of software development, then tested periodically as the development effort produces software that is ready to be tested by the IV&V team. With an Agile, approach outcomes are less predictable and therefore the IV&V team is constantly trying to keep pace with what the Product Owner has defined as an acceptable outcome. This situation leads to the perception that in an Agile environment, the traditional approach to IV&V is duplicative to the testing performed by the software development team and Product Owners, and therefore may add unnecessary cost.

Solutions

Set Expectation that IV&V Testers Will Be Integrated into the Project Team

On an Agile project, all testers are an integral part of each Agile team from the outset, and the iterative, cyclical nature of the project results in a consistent rhythm of handoffs from development to testing and back again. This rhythm results in a unique, end-to-end perspective of testers being incorporated early in the design and development process, and often solves defects before they hit the critical defect stage.

The Agile approach therefore allows IV&V testers to begin the creation of test cases and test scripts early during system development – these lightweight testing documents follow the Agile principle of reduced documentation, in contrast to pages of extensive testing requirements.

Additionally, test scripts can often be given to business stakeholders, allowing them to perform system tests themselves. This approach solidifies the relationship between the team and the business, and further verifies the functionality of the solution with the business, while increasing their sense of ownership.

However, the more integrated the IV&V testers are within the development team, the less "independent" they may become. With an Agile approach, which favors collaboration, there is less need for independent or disconnected activities, which makes some IV&V purists nervous.

Refocus IV&V towards Quality Control and Process Improvement

The classic approach to IV&V focuses on executing test cases to verify that requirements have been met. Agencies should refocus IV&V to perform quality control on the team's methods and processes, looking for systemic problems and process improvements. In addition, IV&V should focus on quality control for the entire program's work streams, not just the software development work stream. With Agile, product owners are the ultimate decision-makers regarding the quality of the system, eliminating the need for an independent verification group. As a result, the Government will reduce duplicative testing efforts as well as support a key tenet of an Agile approach, which is the need for continuous improvement. This new definition and objective of IV&V should be set as an expectation while defining the acquisition strategy in order to gain buy-in from stakeholders.

Conclusion

In the federal space, traditional approaches to acquisition and procurement are perceived as incompatible with the use of Agile methodologies to develop IT software solutions. Since Agile development is increasingly regarded as a leading practice, traditional approaches to acquisition are a roadblock to effectively acquiring and implementing Agile IT solutions within the Government.

Conducting interviews with IT executives and acquisition professionals revealed many of the challenges inherent in implementing Agile within the Government. These challenges occur throughout the entire lifecycle of a project, and will necessitate significant changes in the acquisition, evaluation, and management of projects in order to successfully implement Agile development. These challenges can be addressed by considering the unique aspects of Agile systems delivery beginning in the early stages of acquisition planning.

Solutions to these challenges include improving the Agile knowledge base, where acquisition professionals are exposed to the principles of Agile and coached through the adoption of Agile projects. They extend to ensuring the flexibility of contracts while controlling cost. Solutions continue with the establishment of strong product owners who are dedicated and empowered. And finally, selection of the right contract type.

By creating a strong foundation of institutional knowledge and stakeholder ownership, and allowing for a flexible approach to acquiring and administering Agile IT services, the Government can overcome its acquisition challenges and encourage Agile adoption. As a result, the Government can more effectively and efficiently deliver software and IT services.

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Appendix

About this Paper

ACT-IAC has drafted this white paper in order to explore how various agencies are conducting acquisition efforts for software development that will use an Agile methodology. As a refresher, Agile development is an approach to software developed articulated in the "Agile Manifesto" at www.agilemanifesto.org.

Research Methods

Data collection for this paper consisted of a series of interviews with various government IT executives and acquisitions professionals. As the purpose of this paper was to seek candid information, these conversations were not 'on the record' and comments are not attributable to a specific individual or agency. Interviews were conducted using a series of standard questions to guide an open conversation around Agile acquisition and procurement in the federal space.

Standard questions used during interviews

1. What are your expectations for Agile vs. waterfall?
    a. Do you anticipate significantly better (or worse) results?
    b. Do you have a quantitative estimate for these expectations?
2. Are you seeking to acquire anything other than software development that will use an Agile process/methodology?
3. What do you anticipate acquiring in order to prosecute your Agile implementation?
    a. Staff augmentation
    b. Consulting services
    c. Complete solutions
    d. Other?
4. Do you perceive any regulatory or policy hurdles/inhibitors to the adoption of Agile?
    a. FAR
    b. DoD5000

    c. Department/Agency specific guidance?
5. What contract type(s) do you anticipate using to acquire Agile?
    a. T&M, LOE
    b. FFP
    c. Incentives?
6. How do you approach the definition of the deliverable (product) in a contract when you anticipate using Agile?
    a. How do you approach the definition of “done”?
        i. Pre-award or post-award?
        ii. With the contractor, or unilaterally by the Government?
7. How ready is your agency’s acquisition office for Agile?
    a. Have you defined an approach or “playbook”
    b. What training have you conducted or plan to conduct,
    c. Have you created any templates, accelerators, or other reusable artifacts for Agile?
8. Do you anticipate any changes to communications between Government and contractors in Agile projects?
    a. How do you achieve transparency?
    b. Do you anticipate any changes to the type or number of documents that will be required?
9. In your approach to Agile, have you considered how to empower a set of customer representatives who will be involved daily?
    a. Have you anticipated how to empower them to make “on the spot” (timely) decisions?
    b. Are you familiar with the role of product owner and if so how will you implement that role?
    c. Have you considered how to engage end users in the Agile process?
10. Do you foresee other organizational hurdles – what organizational or cultural inhibiters do you anticipate might arise with the implementation of Agile?
    a. What is your plan to deal with them?
11. How do you anticipate measuring efficiency and quality of delivery when using Agile?
12. How do you anticipate handling changes?
    a. Traditional contract mod process
    b. Empower COR (within bounded range)
    c. Empower product owner (within bounded range).

Detailed List of Challenges Addressed in this White Paper

1. Lack of familiarity with Agile among acquisition professionals
2. Perception that Agile equals higher risk
3. Lack of empowerment and accountability
4. Lack of commitment and engagement
5. Typical performance measures do not measure customer satisfaction or value
6. Lack of pre-defined documented standard to define acceptance criteria
7. The drive towards firm-fixed price (FFP) scope contracts
8. Difficulty accounting for all government costs
9. Approach to IV&V may add unnecessary cost

Detailed List of Solutions Proposed in this White Paper

To address these challenges, this white paper has identified the following potential solutions:

1. Educational sessions and Myth-Busting campaign
2. Project exposure for acquisition professionals
3. Agile procurement coaches
4. Refocus attention on “top 4 risks”
5. Identify and empower stakeholders early
6. Product owner as a near full-time role
7. Product owner as career building role
8. Collaborate with stakeholders, agency leadership, and omb
9. Focus on core capabilities and iterative documentation development
10. Adopt suitable cost and schedule performance measures
11. Measure quality via customer satisfaction
12. Avoid firm fixed price (FFP) scope contracts
13. Identify, track, and quantify internal government costs
14. Address the myth of administrative burden on flexible projects
15. Set expectation that IV&V testers will be integrated into the project team
16. Refocus IV&V towards quality control and process improvement

List of Challenges to Be Addressed In Future Versions of the White Paper

The interviews uncovered challenges that have not yet been addressed in this white paper. The list below provides a brief description of remaining challenges. Future versions of the white paper will address some of these challenges.

1. Lack of understanding of the flexibility provided in the FAR to select appropriate delivery methods, such as Agile; address perception that the FAR does not support Agile projects.
2. GAO concern about traceability from requirements to delivered software
3. Strategic sourcing vehicles limit choices in terms of selecting from the best contractors, and waiver criteria are vague and difficult to apply.
4. Privacy, policy, and legal reviews can create significant delays.
5. Difficulty defining evaluation criteria to fairly evaluate bids and avoid protests.

6. Difficultly streamlining an acquisition process to quickly procure small increments or releases.
7. Government teams often support multiple projects, and may be pulled from a given project at any time, creating turnover issues for Agile teams.
8. Contractors don't know how to implement and execute change management strategies within an Agile environment.
9. Contractors fear being measured by user/client satisfaction, believing that this is a difficult metric to measure or quantify.
10. Inconsistent involvement from all participants in the solution – technical, business process, financial, contracting, functional, and end users must be involved early in the acquisition cycle and continuously throughout the cycle.