Agile Methods in Air Force Sustainment
featuring Eileen Wrubel as Interviewed by Suzanne Miller

Suzanne: Software sustainment is a priority for the Department of Defense (DoD), specifically the Air Force, where costs can easily reach 60 to 80 percent of a weapon system's total lifecycle cost. In this podcast, we will discuss how Agile techniques--and some interesting variations of them--are being used in the Air Force as part of software sustainment.

Welcome to the SEI Podcast Series, a production of the Carnegie Mellon University Software Engineering Institute [SEI]. The SEI is a federally funded research and development center sponsored by the U.S. Department of Defense and operated by Carnegie Mellon University. A transcript of today's podcast is posted on the SEI website at sei.cmu.edu/podcasts.

My name is Suzanne Miller. I am principal researcher here at the SEI. Today, I am very pleased to introduce you to my colleague and friend in acquisition research at the SEI, Eileen Wrubel. In today's podcast, we are going to be discussing a recent report that she co-authored with several other of our colleagues examining the use of Agile methods in Air Force sustainment. Eileen has been a guest on the podcast series in the past where we discussed our joint research on Agile software teams and how they engage with systems engineering.

First, a little bit about our guest. Eileen's research supports the development and implementation of software-related guidance to improve the acquisition, management, and sustainment of the software component in Air Force systems. Her research efforts focus on Agile and acquisition, with a special interest in sustainment and contracting issues, both very important topics. Welcome, Eileen.

Eileen Wrubel: Hi Suzanne, it's nice to be back.

Suzanne: Yes, it is. Alright, let's start off by having you explain for us what we mean when you talk about sustainment and when you talk about Agile in the context of the Department of Defense together. Those are not terms you often hear in the same sentence. Obviously, the Air Force in particular, we are talking about.

Eileen: There are plenty of definitions of Agile, but for the purpose of this series of reports, we use one that is paraphrased as *an iterative and incremental approach to software development performed by highly collaborative teams with just enough ceremony to produce high-quality software*. Software development in a sustainment organization doesn't change this definition of Agile, but the focus of the team's efforts is on software maintenance and software sustainment.

When we say software maintenance, we are talking about *correcting faults, improving performance, or other attributes; adapting to changing organization and technical environments; and performing preventive maintenance*. When we talk about software sustainment, it includes all of that, but it also addresses other issues such as documentation, operations, deployment, security, configuration management, training, help desk, COTS [commercial off-the-shelf] product management, and tech refresh.

Suzanne: OK. So, it's a much broader set of things than just software maintenance. When you talk about Agile, Agile mostly deals with the software development aspect of that, but it could bleed over as we know from systems engineering and other reports in to other areas.

Eileen: That's right.

Suzanne: OK. So, what did you find? Why did you do this research in particular, and what was interesting about it that you found?

Eileen: So, as you know, Suzy, it is pretty well understood that the majority of the software lifecycle occurs during operations and sustainment. So, the Air Force supplied us some funding to look into the use of Agile methods in the sustainment phase of Air Force programs to see what we could learn.

Suzanne: And, what did you learn?

Eileen: Our research found that the Air Force relies on two basic types of sustainment organizations: organic groups—that is, teams of government employees—and contractors. I'll give you a little rundown of the characteristics of these teams in a couple of areas.

In terms of team size, contractor sustainment teams tended to be 10 or fewer, typically what you would expect. On the organic side, we had teams ranging from anywhere from 7 to 50 people, depending on how the organization was constructed and what they were working on.

Suzanne: Some of that has to do with that expanded definition of sustainment; not all 50 people were working on software development. Some of them were working on the training or the installation or the licensing issues and other things, right?

Eileen: Exactly. And, I'll talk about that in just a minute when we talk about team cohesion.

Suzanne: OK.

Eileen: On the organic side of the house, we still typically have separate teams of system engineers, software developers, and test and evaluation professionals. Those teams tended to operate using Scrum methods, but they were separate, kind of separate entities that interacted…

Suzanne: They weren't integrated.

Eileen: On the contractor's side, you had what you more or less expect from an Agile group, where you've got system architects, engineers, software developers and testers populated inside of every Scrum team.

Suzanne: OK.

Eileen: We also found that your organic teams tended to use maybe slightly longer sprint cycles, maybe about 4 weeks compared to the 2 to 3 that we saw in the contract side; [and] much longer release cycles, typically anywhere from 12 to 27 months. On the contractor's side we're releasing product [in] 6-, 12-, 18-, 24-month cycles. A lot of that just had to do with the delivery requirements on the contracts for the particular products.

Suzanne: Sometimes the organic teams are organic teams because there are additional kinds of release requirements for security or other purposes. So, you wouldn't even consider having a contracted team for that. So, some of those have to do with the domain and the nature of the software being sustained more than organic versus contract. Would you say that is what you saw?

Eileen: I think that is part of it, yes.

Suzanne: OK. What do you see happening differently in terms of Agile approaches? You have talked about the teams—one on the contractor's side being more integrated than on the organic. What other practices did you see that were different, or was everything the same? Was it, *If I am on a Scrum team on a development contract, and I move over to sustainment, am I going to experience the same things?* What kinds of things did you see in terms of the practices and the ceremonies?

Eileen: So, both types of organizations tended to use some variant of Scrum tailored to their specific needs. There's typically a product owner, typically a Scrum Master, and a team completing work in progress. Those roles may obviously have different names depending on the environment.

One of the big things that we noticed is that, in terms of release planning and identifying what functionality needed to be in a release and how it was prioritized, organic teams tended to be

pretty well integrated with the program office, collaborating to identify the functionality and prioritizing releases. On the contractor side of the house, they got involved after the government had identified and prioritized those requirements, which sort of makes sense…

Suzanne: They focused more on implementation than they did on the prioritization and the framing of the release.

Eileen: Exactly. Exactly. We also observed some other differences in practice surrounding how the teams established their definition of *done*. Typically, on the contractor's side, we observed what you'd expect from an Agile team when upfront in the sprint or upfront at the release, the definition of done is agreed to by all the parties.

On the organic side, we typically found that that floated along a little bit. They used weekly or monthly collaboration meetings between all those teams, but the definition of *done* might evolve over the course of that collaboration depending on the timeframe when the work product was needed and how the teams interacted.

Suzanne: So, there are some things that are different about the, like you said, the collaboration with the program office and with the users on the organic side. So, they actually probably have a little bit more insight into what's happening in operations, and those things can affect the definition of *done*, the priorities as you go through. So, that is another area where the organic side has a little bit of a different context than the contractor's side.

Eileen: Absolutely.

Suzanne: One of the things that strikes me about what you are saying is that the practices are sort of the common ones: sprint planning, et cetera, that we see—but, they may be applied either in a larger context in the organic side, or they may not be quite as strictly adhered to in terms of time boxes and some of the things like the definition of *done* you spoke about. But, generally speaking, they are following what we would call basic Agile practices.

Eileen: Right, those core practices are there. They may be called something different. But, all of the teams that we observed are working from product backlogs and sprint backlogs. They are using burn-down charts to communicate. They all engage in release planning and sprint planning. They all engage in demos and retrospectives. And, they are all using things like a daily or a weekly Scrum of Scrum meeting.

Suzanne: Sustainment is something that isn't going away. As we said earlier, it is 60 to 70 percent of the lifecycle. So, this is a topic that is going to continue to engender research. In the future, we should see some more on different effects and different approaches I would think, not just for Agile but for Lean and other kinds of approaches to sustainment. But, how can

organizations that are facing sustainment, that may not be using Agile methods already, how can they use the research that you have done so far?

Eileen: Sustainment organizations interested in leveraging or transitioning to Agile methods can take a look at Anderson's Six Principles Essential to Modern Project Management as their organization transitions to Agile and looking at what we've presented here.

Suzanne: And, that is David Anderson, who is very much in the Lean and Agile software community.

Eileen: Yes. And, I'll paraphrase: *Increasing return on investment by making continuous flow of value our focus.* That is continuous, ongoing release in an incremental fashion.

Delivering reliable results by engaging customers in frequent interactions and shared ownership.

Expecting uncertainty and managing for it through iterations, anticipation, and adaptation.

Unleashing creativity innovation by recognizing that individuals are the ultimate source of value and creating environments for those individuals can make a difference.

Boosting performance through group accountability for the results and share responsibility for effectiveness.

And, *improving effectiveness and reliability through situationally specific strategies, processes, and practices.* And, we saw that happening as they adapted Scrum and Agile techniques to best suit their particular organizational needs.

Suzanne: Right, because the biggest difference in sustainment is that your source of material that you are going to use to actually develop something isn't somebody's idea of what should be in a system. It is usually changes that are needed because of the environment, changes that are needed because of defects. So, you have got kind of a different source. I think that is one of the things that drives some of these differences in the way that Agile is applied. As you see from Anderson's principles, they're very well connected to the traditional Agile principles that you get out of the Agile Manifesto. That is good advice.

What else do you think we will be doing at the SEI in this area? Do you have any follow on work scheduled with the Air Force? Has there been any reaction to this research so far? Or, right now are you really just going on to the next thing?

Eileen: Right now, we are looking on to the next thing. We are looking at Agile and contracting in the DoD environment and how programs can be successful in that area. And, we'll see where these roads take us.

Suzanne: Excellent. Well, we look forward to your continued research in this field. Thank you very much for joining us today.

To view the technical note that Eileen co-authored with Colleen Regan and Mike Bandor, Mary Ann Lapham, and Stephen Beck, you need to go to the SEI digital library at resources.sei.cmu.edu/library.

In the search field, enter the name of the technical note, *Agile Methods in Air Force Sustainment: Status and Outlook* to view all related resources on this topic.

This podcast is available on the SEI website at sei.cmu.edu/podcasts and on Carnegie Mellon University's iTunes U site. As always, if you have any questions, please don't hesitate to email us at info@sei.cmu.edu. Thank you for listening.