SEI Podcasts

Conversations in Artificial Intelligence, Cybersecurity, and Software Engineering

When Agile and Earned Value Management Collide: 7 Considerations for Successful Interaction

Featuring Pat Place and Stephen Wilson as Interviewed by Suzanne Miller

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

Suzanne Miller: Welcome to the SEI Podcast Series. My name is [Suzanne Miller](). I am a principal researcher in the SEI Software Solutions Division. Today, I am joined by my friends and colleagues [Pat Place]() and [Stephen Wilson](). Stephen is an Agile test engineer in the Agile transformation team, and Pat is a senior Agilist in the Agile transformation team. We work together a lot, and I am really thrilled to have them here today to talk about a subject that has been in the government space for a while, and that is [Agile and something called EVM](). If you aren't familiar with that, it means earned value management. Before we get started into that topic, though, we usually like to ask our guests to say a little bit about themselves and what brought you to the SEI. I like to ask, what do you think is the coolest thing you get to do at the SEI? And since you are new to us on the podcast, Stephen, I am going to

start with you.

Stephen Wilson: Yes, so thanks for having me here, Suz, or Suzanne. Let's see. I have got a lot of experience with a lot of different things. I have been a lead systems integrator and contractor. I have been in program offices. I have been, as I mentioned, a contractor. I have also worked for the government directly for the Air Force. So when I was looking for cool new opportunities up in the Pittsburgh area, I thought the [FFRDC [Federally Funded Resource and Development Center]](#) SEI would be a good opportunity for me to leverage all of these things at once. I don't claim to be an expert at anything, but I have touched a lot of it and interacted and been a part of a lot of different aspects of acquisitions. I think you get to bring all that together here at the SEI.

Suzanne: Agreed, Pat?

Pat Place: Back in the early days of SEI, there was interest in formal methods. I think dinosaurs also roamed the Earth at the same time.

Suzanne: It could be.

Pat: That is what brought me to the SEI. I think the coolest thing about the SEI is the ability to change. I came in [with an] emphasis on mathematics in software, and I have had the opportunity and the luxury of being able to look at a whole scad of different things over the years, and that I think is super cool.

Suzanne: Yes. I would have to say that's on my cool list too. You and I have worked on some of the same different things as we have gone through our careers.

Pat: Indeed, we have.

Stephen: Just to add to that, just the opportunity to work with really accomplished people. We get to spend a lot of time with different customers. I think my colleagues at the SEI and also the people that we interact with—a lot of different people that have a lot of different backgrounds. There is a lot of smart people out there, and I enjoy learning from all of these different people I interact with at SEI.

Suzanne: Learning mindset is I think one of the things that is common to many of us at the SEI and wanting to learn new things. All right, so let's dive

into our topic. This is a topic that is kind of focused on the acquisition aspects of software-intensive systems more than the technical aspects and the project management aspects. We know that we are seeing more government acquisition programs using Agile methodologies. We also know that they are often told they are going to use—even if they don't volunteer to use—techniques like EVM. Before we get into sort of the interactions of those, Pat, could you just give us a sort of one-sentence version of Agile and a one-sentence version of EVM. For those that don't understand or don't know these methods already, we will have a whole bunch of resources in the transcript for you to catch up on these two topics, especially EVM. A lot of the Agilists really don't know EVM.

Pat: Sure. So Agile is a set of principles, a set of practices that are really focused on helping you initially develop software, develop software that is going to meet the needs of customers. Too many government experiences in the past showed we could develop lots of software, but no one would use it. EVM is a technique that actually dates back to I think the mid-60s, which is focused on management and value management. It is a way of assessing or using past history to assess progress and to use that past history and recent history to predict the future. Some of the most important predictions are how long it is going to take you to complete and how much it is going to take you to complete.

Suzanne: Yes, and one of the things that I have noted over time about the two, Agile emphasizes short iterations, delivery on a short cycle of often a minimal viable product or something like that, the progression. Where EVM also, you can use it in that setting. But in the settings I used it for in the 80s and the 90s, it actually focused on surrogates for progress as opposed to the direct product that was evolving. That is I think is one of the interactions that I think trips people up is that you have got a little bit of apples and oranges in terms of what is it that they're actually trying to deal with.

Pat: I think that has changed.

Suzanne: OK. I told you, 80s and 90s.

Pat: If I got into the weeds, I would say that work packages are focused on the accomplishment of the actual work, and the completion of work package is a good surrogate for progress. Especially if you have a set of, *Here is all the work I have to do*. *Here's the work I have done, and this is what I am currently doing*.

Suzanne: Fair enough. OK.

Pat: So, I think you get a good progress measure there.

Suzanne: That's good that it went beyond that because that was not a very satisfying aspect of using it in those days. Let's talk about your blog post, which is one of the reasons we are talking about this is so that people will learn lots of things about your blog post. You outline seven ways in which Agile and EVM positively influenced programs. I would like to go through those a little bit here. What are the virtues of Agile and EVM together that are going to make it attractive for people that may not be using either one of those to think about using them together? Do you want to start us off with a couple of those, Stephen?

Stephen: Yes, sure. Fortunately, I was anticipating this question, so I did write those down. We have *big design up front* [BDUF] versus planning as late as possible. To me, this really resonates with where the two methodologies at least appear to clash a little bit. If you get a chance to look at the blog, that is an important section, I think. We have assessing feasibility where we talk about…we compare IBR versus an EVP.

We also have how far down the hierarchy of Agile work does the EVMS [EVM system] track? You often hear about the epics, features, and stories and maybe tasks even below that. Does the EVM system, should it track all the way down to that lowest level, or is that minutiae, resolving the tension between relative and absolute estimation? I think that was one that Pat was particularly interested in. Pat, do you want to close out the other three? Or, do you want me to keep going.

Pat: You might as well. You have got them.

Stephen: OK. We also have words matter, agree early. Maybe that sounds overly simplistic, but we have seen where terminology throws people off. The terminology that the Agilists are comfortable with and the EVM folks, the program managers, sometimes they have a different interpretation or different nuances of what that means. When those things don't align, you get a problem there, so that is one of the other things we explore. What is the right amount of administrative review when doing BCRs, baseline change requests? Do you need to do a baseline change request review board? Does it need to be as formal as I have seen in some of the programs I have supported? When you have all of the experts there at, say, like a PI planning event, do you also have to do an additional BCR review board? Then lastly,

we have assessing progress where we explore percent complete versus...

Suzanne: Story points completed.

Stephen: Yes. Thank you.

Suzanne: You mentioned relative and absolute estimation. I think that is one of the areas where trying to resolve the apparent conflict in those is probably going to be important to people. Pat, do you want to talk a little bit more deeply about what are the issues and interactions between Agile and EVM in that case?

Pat: Sure. Sure. When you set up any earned value management project, EV project, you have to assign budgets to various lines of work. You have to assign a scope with the associated budget. Some of that has to be done fairly early on in the development. It goes back to the big design up front. You can set up, *Here is just a big bucket, and we'll draw from that*, but when you start to break stuff out, you've got to break it out into budget specifically and the scope. The budget will depend upon that scope. But budget is always estimated in terms of hours or hours translated into dollars and maybe other things that you have to purchase. What we focused on is the distinction between that sort of hours estimate versus the story point estimate that you would do in a purely Agile program where that is not as important. There is a huge tension here between these two methods. What we do is basically say, *Well, it's up to you. You in your project, in your context will have to resolve that tension between these two constructs that are looking at the same thing, hours and story points*. And there is no right answer. There will be a right answer for you.

Suzanne: My experience is that we tend to, in the government at least, the story points aspect of Agile, the relative estimation of Agile, tends to be at the small team level. That goes back to another area of interaction is, how far down do you go? Because if I am really only using relative estimation at that team level, I may not really run into as much of a conflict because I am already using absolute estimation at higher levels. Is that a pattern that you have seen?

Pat: Yes and no. Good answer. The problem is that if you are following all of the principles of earned value management, you have to not only look at your work-breakdown structure (WBS), but you have to look at your organizational breakdown structure. That will get you to the team level. So now the team's estimates are immediately important again because I have to

create different work packages for different organizational structures.

Suzanne: Gotcha. That means if I am using story points, I need to translate them in some way if I am going to be consistent with the sort of hierarchy going up.

Pat: There are pretty standard ways of doing that. One of the commonest we have seen is make one story point equal an ideal day or half of an ideal day.

Suzanne: I have seen that too.

Pat: I think we have all seen that.

Suzanne: Yes.

Pat: Then you get that translation, but it also loses the value because you have already estimated the number of hours that were going into this project, and so those story points become less relevant.

Suzanne: Sure. OK. So estimation leads me to then progress, right? I have estimated what the work is going to be and then we execute the work, and we need to measure the progress of the work. Why don't you talk a little about that? What are the different ways of measuring progress in Agile and EVM that are typical and how you have seen those get resolved?

Stephen: Yes. Good question. I don't know how you escape in acquisitions. At some point, you have to say, *Here is what the end goal is going to look like*. We often call that big design up front. In certain contexts, you have to say somebody, some boss, some leadership somewhere says, *How big is this and how long is it going to take?* EVM works I believe well with that. Traditionally, it does, where you define really up front what you think your end point is going to look like. Then EVM measures the cost and schedule as you arrive to that point. *Did you hit your mark? You have made a plan. How well did you arrive at that plan typically based on the cost and schedule to get to that point*? Agile, on the other hand, is looking at generally a closer-up planning. It really encourages demonstrations and interactive development. At the end of these different time boxes, you have a chance to review the product. You are often reviewing... You are looking at the actual product versus the documentation that shows as you are arriving with EVM.

Suzanne: Right. One of the things that I have seen with that is that the EVM approach, the traditional approach, big design up front, is mostly what I call a

sunny day estimate. That is traditionally what that is looked at…

Stephen: It's never right.

Suzanne: It's never right. That is part of the thing is, EVM helps us to see that we are deviating from that, and that it may be time to relook at what have we learned. What is going swimmingly and what isn't? Whereas Agile is looking at that all the time in terms of, what did we learn? But it's like every two weeks or every week or whatever our iterations are. We are looking at what did we learn, what do we need to do next, and making more small adjustments in many ways. Where I see in programs that are not Agile, there are really the points that we make those, we need to do something different. We tend to end up with greater difference between where we are and where we need to go next. How do you help the Agilist understand how to communicate with the EV people to say, *It is OK that we are deviating these small amounts because that is learning*? How do we account for that in the EV? Because if you can account for that, then people feel a lot better about EVM and Agile together.

Pat: Sure. I think if you don't break out all of your work packages on day one and have this plan that is set from now until the end of time, as I said, of work packages, then you have some options. Earned value certainly allows that. You can keep a lot of work in planning packages rather than work packages and you can keep a lot of money in management reserve and deliberately keep that, so you can fund things as you do that learning. I think from an earned value perspective, once you have broken something into a work package, then the learning is limited, and you will get the cost variances and the schedule variances as things go well or awry. Usually, awry.

Suzanne: There is a lot of that.

Pat: No, I really want to focus on this. You can delay that development of the work packages until quite late on. There has been some discussion within the government that says, *We are actually going to break one of the standard EV guidelines, and where we'll break it is we will actually allow work to start before the work package is fully formalized.*

Suzanne: Oh, interesting.

Pat: Now, we don't want it to go all the way. But if you formalize a work package that is expected to cover a three-month period, in the first week or two, that is kind of OK. This allows you I think to get a lot of that learning and

still have a sense of, *Here is my backlog*. We can adjust our estimate to complete based upon learning, but we don't get those sort of little variances at that middling level.

Suzanne: That is the other thing. It comes down to how far down do you go? Pat and I worked a program where they were having work packages that were at the iteration two-week level, in terms of timing. So every time there was a variance of some percentage, which happened a lot, somebody was spending all their time creating the variance report and explaining this variance, which really wasn't as much a variance as it was, *Look at all the stuff we are learning*. That became an administrative burden that was very, very onerous. I know for that program, we recommended that the work packages go up to a three-month level. Is that something you are seeing as more of a standard now in the government? That you try and keep those work packages and planning packages at a high enough level that you don't end up with this really, really in-the-weeds variation?

Pat: Yes. Guidance suggests that the lowest level your earned value should track is to what we call a feature. Now, they don't actually define how big a feature might be. But typically, from the earned value perspective, you want those work packages to be in the one-to-three-month range and roughly corresponding to the feature level. It is not always one to one, one feature, one work package. There are distinctions. We go back to you might have a work feature that is worked on by multiple teams. From an earned value perspective, that means it has got to be two work packages, one per team. But again, the duration is not that long. So having work packages to the three-month period is about right. But from an overall... If you want to have Agile and EVM work well together, from a contractor's perspective, if they can measure progress, where is where we started this question, by completion of the work package, then they can get their money for that.

Suzanne: They can get progress payments.

Pat: Progress payments. We can measure completion of a work package by completion of a feature. It is done or it is not done, and that makes the percent complete calculation trivial when we have got that sort of mapping. We can even do that mapping even if a work package contains multiple features, because we can see how percent complete each is based upon their story points to overall estimate. In that sense, I think there is some good movement and some really nice synergy between Agile and EVM.

Stephen: Yes, I like what Pat said. You are touching on something that is

important. Generally, what I have seen in the guidance is that at the feature level, that is what you want your EVMS, your earned value management system to track. A feature for me may not be a feature for you, right?

Suzanne: Sure. That goes back to the words.

Stephen: The terminology.

Suzanne: Yes.

Stephen: But in general, a feature is something that is executed, can be executed within three months-ish, and it is something that is measurable that you can see some value added by that feature.

Going all the way down to like two-week iterations to track those with EVMS, as you said, can be very tedious. Oftentimes you are measuring something, but you are not actually seeing any significant development that you can say, *Yes, we are on track or we are not.*

Suzanne: Right. Yes, that was a big learning for me. What is the most surprising thing that you learned in doing this work in terms of how Agile and EVM interact? I will give you a second because I know that is not something we talked about at the beginning.

Pat: Yes, actually, to me the most surprising thing is how flexible earned value management actually is. When you look at the guidelines, there is a lot of opportunity for interpretation. Previously, I have met some earned value management people who have espoused a lot of ideas that would be utterly antithetical to an Agile development. You probably still meet those people out there. But certainly what I am seeing in terms of government guidance is much more in terms of how to make these systems work together. That flexibility is, can we allow work to start before the work package is formally instantiated?

Suzanne: OK.

Stephen: Yes. Don't tell anybody I said this, but from my background, I didn't really like EVM, to put it nicely. It was something that me and my colleagues, and even some of the PMs that I had worked with, we doubted its value. *What is this giving us?* That was my bias as I came into SEI, and I started getting into these working groups talking about EVM and Agile. I guess one of the stereotypes, this is probably what surprised me, is that I oftentimes

thought of the EVM experts as being closed-minded. *I only want to do it this way*. They are really set in their ways. What I have learned as I interact with experts in the community, really capable people again, is that they are very open-minded. They do want to see Agile and EVM work together. They are not just buried into the dogma that they grew up with. Again, it's the people that shocked me the best.

Suzanne: Yes, and I think this is one of the reasons that podcasts and blogs like this are important because people do have stereotypes for Agile as well as EVM. Giving people better information about what's possible, what's feasible, and what people have achieved is important. When I first learned EVM back in the 80s, I was very excited about it because up to that point in the projects I had worked on, it was very hard to demonstrate any kind of progress. But I quickly learned that the way I interpreted even the guidelines they had then, and the way others interpreted it were very different. I think one of the things I would take away from this is if you are dealing with somebody on either side, the Agile or the EVM side, that you feel are dogmatic, go back to some of the source materials or find some of the experts that have published things on flexibility so that you can help people get through. I find a lot of times the close-mindedness is actually because of lack of experience or lack of really deep knowledge. If you can help people get past that, then you can help them to understand better how to make concepts like this work well together. That is one of the reasons I was excited to do this podcast.

Are there cautions that you would give acquisition professionals that want to incorporate Agile and EVM together? What are the gotchas that you want to watch for? I go back to make sure your words are clear, your terminology is clear, but are there some other particular precautions that you would want to highlight? Pat, why don't you go with that first.

Pat: Yes. A certain amount of [the blog post](link) focuses on some of the tensions between Agile and EVM. The goal of our blog post was not to say, *Here is the solution*. It was, *Here are the questions you should be asking yourself when you embark on this journey and coming up with the answers*. I, and I am not the only person who believes this, but I strongly believe that how you marry Agile and EVM is extremely situationally dependent.

Suzanne: Sure.

Pat: The answer that works for this program is not going to work for that program. It is going to be, *Let's work our way through it.* There is no standard

path for this. You make your own answers in your context. I think if we spend a little more time developing guidance on how to tailor these two methods together, then I think we have an interesting way forward.

Suzanne: Excellent.

Stephen: Yes. Talking about a gotcha. It is important to know that EVM… Yes, I totally agree with Pat, and that is what we said on the blog, as he mentioned. There is no exact way to do this. That doesn't mean that you can't go wrong. There are plenty of wrong ways to do this, and there are right ways to do it. I think the first thing I would tell somebody, thinking of myself when I first worked in a program office, is at least be aware of the fundamentals of what EVM and Agile are trying to do. Then, as you understand that, you kind of understand where the perceived incompatibilities are. Then you can kind of forecast, *OK, I see where we are trying to go with EVM. I see where we are trying to go with Agile*. You can start to predict where your problems are going to be. Understand that early so you can start to work on this path forward early. And shameless plug: I think we explored that pretty well in [the blog](#), especially in the intro section, so it might be something that people want to take a look at.

Suzanne: Excellent. I resonate with that because I have worked on programs where the EVM system wasn't really developed until they were well into the [EMD, the engineering and manufacturing development phase](#), which is when you are supposed to be applying it, but they were still working out all of the, *How is this all going to work together with Agile?* There was some trauma and drama involved in trying to get people at a point in doing new things when they should have started them six months or even nine months ago.

Pat: I think there is a time to resolve it, and it is at the IBR, the initial baseline review, because that is required to occur within 180 days of a contract award. You usually haven't gone too far into your development if it is a large-scale program. I think that is a good point to resolve the, *How are we in this program going to marry Agile and EVM together?* We are doing that now. We have an IBR where we are going to be invited, coming up in a month or so's time, where we will be asking exactly those questions.

Suzanne: OK. That may take me into another question, which is when you think about transition, what are some of the assets that you are looking at building or helping people with? What are some of the assets that are there now to help people that are approaching this? Are there things that are particular to the SEI that you want people to know about? I know that both of

these, I mean Agile, good Lord, there are a gazillion resources on Agile. EVM, maybe not quite a gazillion, but there are a lot. Anything in particular you want to point people towards?

Stephen: Yes. Are we allowed to point people towards the SEI website?

Suzanne: Absolutely!

Stephen: That is one of the places I start when I am doing research, and I want to learn something. There is a lot of good material on there. Yes, and if you are interested in EVM and Agile, then again check out the blog. We talk a lot about these common issues that you have, so maybe start there for people.

Suzanne: OK. Any other things you'd recommend, Pat?

Pat: There are other resources out there, but they are not widely advertised yet, so it is a bit premature to say that. But there are some interesting groups of people to which we have been invited rather luckily who are having the kinds of discussions I think you need to have. It is just not really open yet.

Suzanne: OK. All right. That is something that if some of those become more open to the public, we can add them into the transcripts.

Pat: Without naming names, I will give an example. I went, not that long ago, to some Agile and EVM training issued by a branch of the government. It was very, very good training on how to do Agile and EVM together. We have since had some discussions back and forth between developers and ourselves on potential improvements. The stuff is out there. It's just not fully primetime.

Stephen: There is NDIA [National Defense Industrial Association] guidance that resonated with me that I looked at. I think I read it twice as I was doing research for this blog actually. I forget the full name, but EVM, NDIA, and Agile. You Google that, you will find it.

Suzanne: Yes, and that will be mentioned in our transcript as well. Perfect. We will make sure that's there. I know Agile and EVM is not the only thing you guys are working on because I work with you on other things too, but what is next for you guys in terms of either taking Agile and EVM further or some other areas of research interest that you might come back and do another podcast for me in a couple of months?

Stephen: Yes. Who goes first?

Suzanne: You started it. You go first.

Stephen: OK. Well, I guess I am not branching too far off. I am in the Agile transformation team after all. I am staying in Agile, but I am working with a couple of programs that are doing risk management, trying to reinvigorate risk management. I think what I would like to do, after discussions with my colleagues, is explore risk management in an Agile development environment. I think there are some holes in some of the guidance that we can help mature that.

Suzanne: OK. Fair enough. How about you?

Pat: Yes. I am still really interested in asking a different question and the question is, with respect to if something is releasable, has it achieved minimal functionality? So, I want to go up against one of the uses of minimal viable product of, it has to do at least this much, because I think that is just the wrong question.

Suzanne: OK. That will be fun.

Pat: I hope so.

Suzanne: We will have some interesting conversations on that. All right, I want to thank both of you for joining me this afternoon and helping to clarify some of these relationships between Agile and EVM. I know that this is an area I had some misunderstandings of how EVM has evolved. I am sure others do as well. I really am happy that we are writing about this and putting information out about this to the government and to the larger audience. With that, I will say thank you to our listeners for being with us today. If you don't know where to find our podcast, we have video and audio. We have Google. We have SoundCloud. We have Spotify. Don't forget Apple. Lots of places that you can get our information. We encourage you to use whatever and whichever of those works best for you. As we have said multiple times, this one will have a lot of resources referenced in it, because this is a very rich topic. I do want to thank all of our listeners, and have a very good day.

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