PMSC Quarterly Meeting, February 1–2, 2011,
Fort Worth, Texas

SUCCESSFULLY INTEGRATING AGILE WITH EARNED VALUE MANAGEMENT

Increasing the Probability Program of Success (PoPS)by "Connect the dots" between Agile development methods and Earned Value Management.

An Opening Thought†

… As the PM community proceeds to build an integrated program management model, working with other functional communities, … , other program management processes will be identified that should be integrated.

As in evolutionary or spiral development, each step towards integration will both make the next step more achievable, and will make the next step clearer..

Agile Offers Unique Benefits To Earned Value

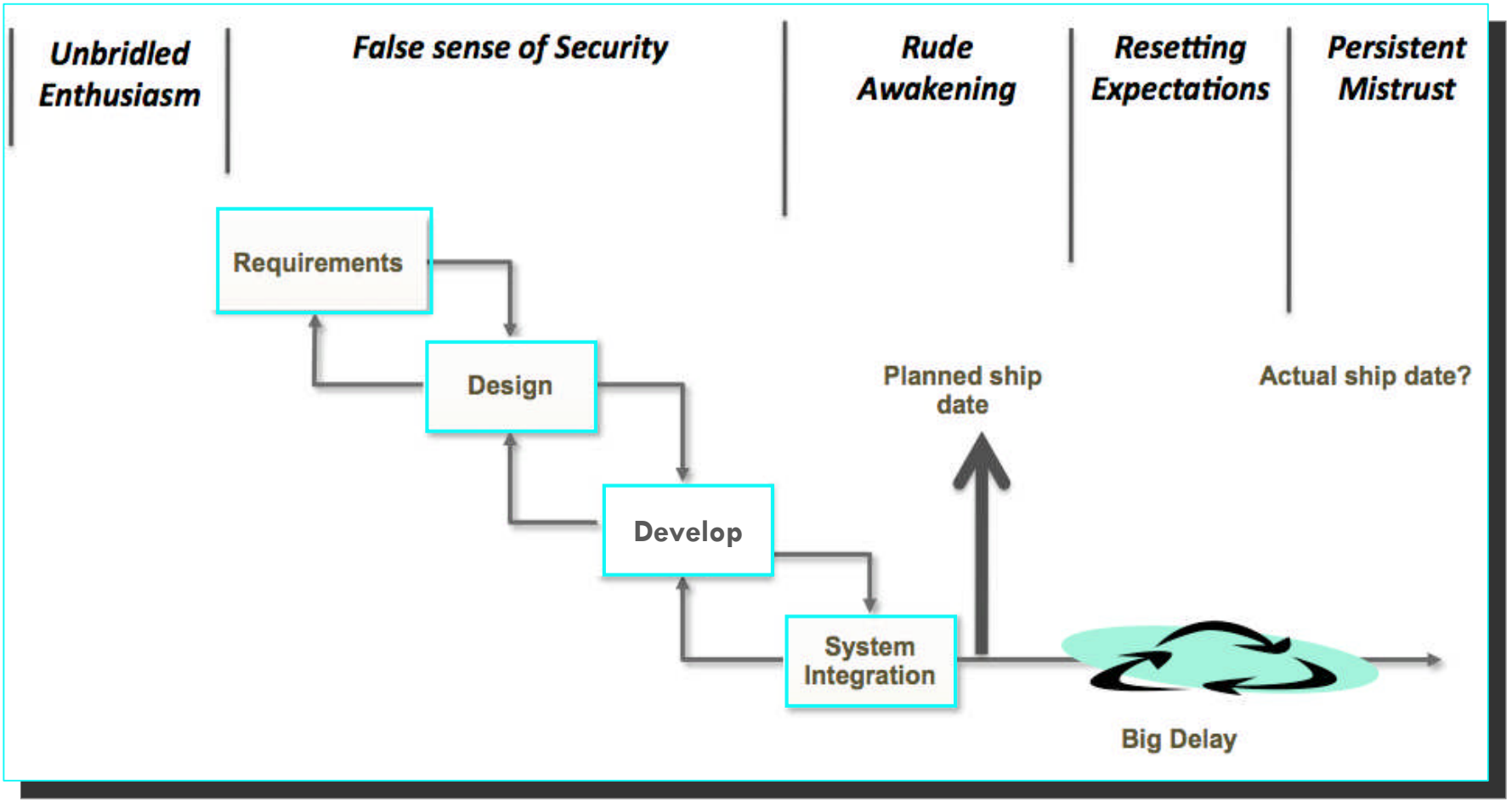
† Integrating Risk Management with Earned Value Management, NDIA, http://www.ndia.org/Divisions/Divisions/Procurement/Documents/PMSCommittee/CommitteeDocuments/WhitePapers/Integrating_RM_with_EVM.pdf

A Sobering Fact For Software Intensive Defense Programs†

- In 115 of the 155 projects (surveyed), project managers did not know what to do.
- 120 project managers overlooked the need to implement a project management principle.
- 125 allowed constraints to be imposed from higher levels that prevented them doing what they know they should have done.
- 130 did not believe that formal project management principle added any value.
- 135 believed that project management processes were flawed.
- 140 thought the Project Manager's goal was something other than the success of the project.
- 145 said policies and procedures prevented them from doing what they knew they should be doing.
- 150 said statutes prevented them from doing what they knew they should do.

† "The core problem of project failure," by T. Perkins., *CrossTalk, The Journal of Defense Software Engineering.* Vol. 3, 11, p. 17. June 2006.

We've Been Part of This Before …



Should There Be Any Question Why We Need To Consider Better Approach?

Connecting the dots between EVM and Agile is our goal.

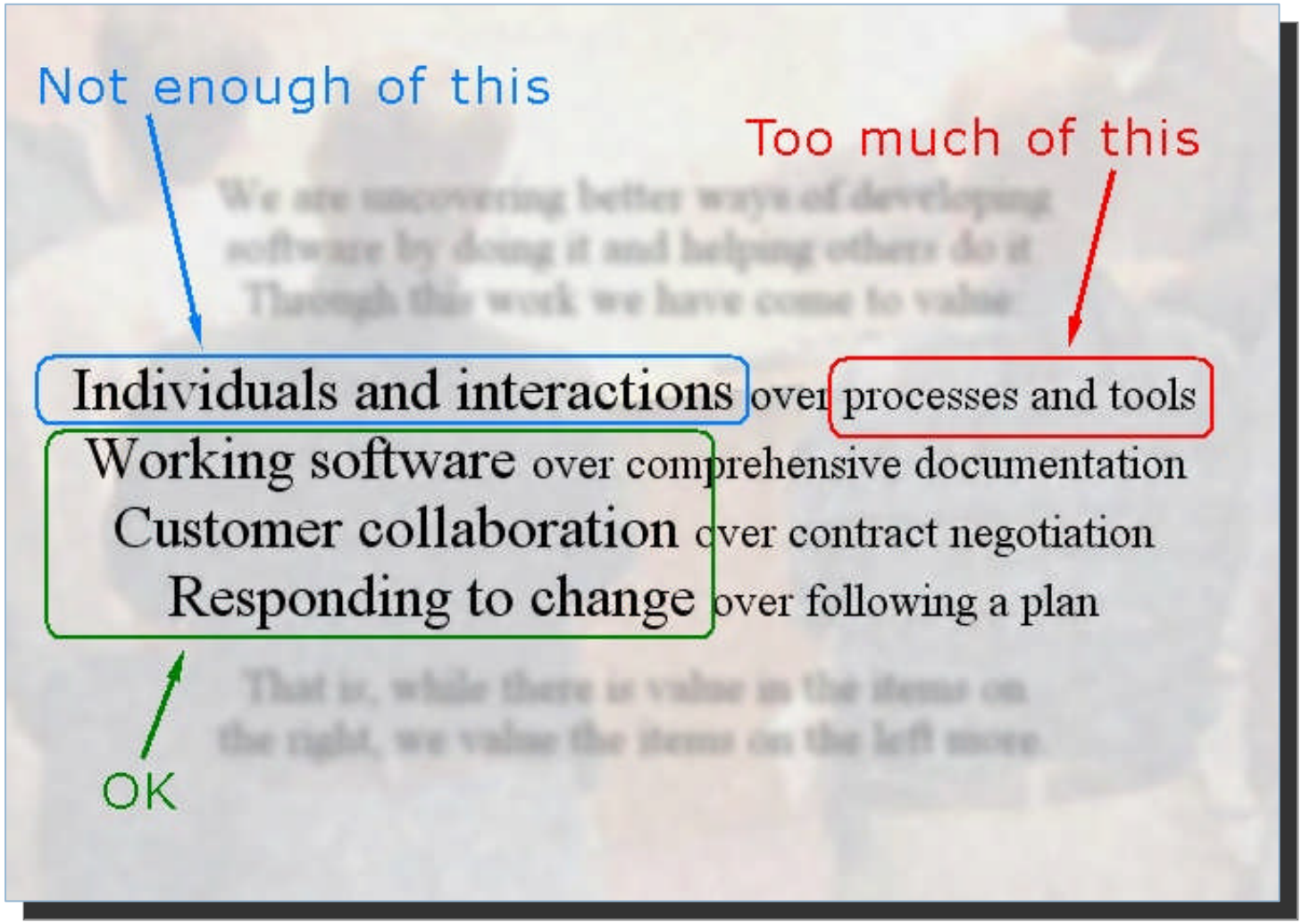
Core Principles for Connecting the Dots

Earned Value Management	+	Agile
Measures of progress in units of "physical percent complete."		Each iteration produces 100% working products.
Forecast of future performance provided by past performance.		Measure of performance in units of product produced.
A systems approach to the development of products and connecting cost, schedule, and technical performance.		Increasing fidelity of product and problem understanding takes place after each iteration and release.

These Appear To Be Conflicting, But They Are Not.
Both measure performance in tangible ways

The Starting Point For Agile …

We've All Seen This Before On Our Programs That Follow Strict EVMS†



† John Rusk's www.agilewiki.com

12 Agile Manifesto Principles

01 Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.

02 Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.

03 Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.

04 Business people and developers must work together daily throughout the project.

05 Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.

06 Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.

07 Working software is the primary measure of progress.

08 The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.

09 Continuous attention to technical excellence and good design enhances agility.

10 Simplicity—the art of maximizing the amount of work not done—is essential.

11 The best architectures, requirements, and designs emerge from self-organizing teams.

12 At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Key Imperatives For Any Project, No Matter the Management Method

- Increase delivered value to the customer
- Manage project and product risk
- Defined requirements match needed capabilities
  - Measure of Effectiveness = Measures of Performance.
- Proven Success using Agile approaches:
  - Involve the customer throughout
    - First release shouldn't be a surprise for customer
  - Regular feedback + accurate status reporting
    - Closed loop, flexible, responsive: enabling change
  - Defer decision making to latest responsible moment
    - Don't try and decide everything up–front

When We Say "Agile" What Do We Really Mean?

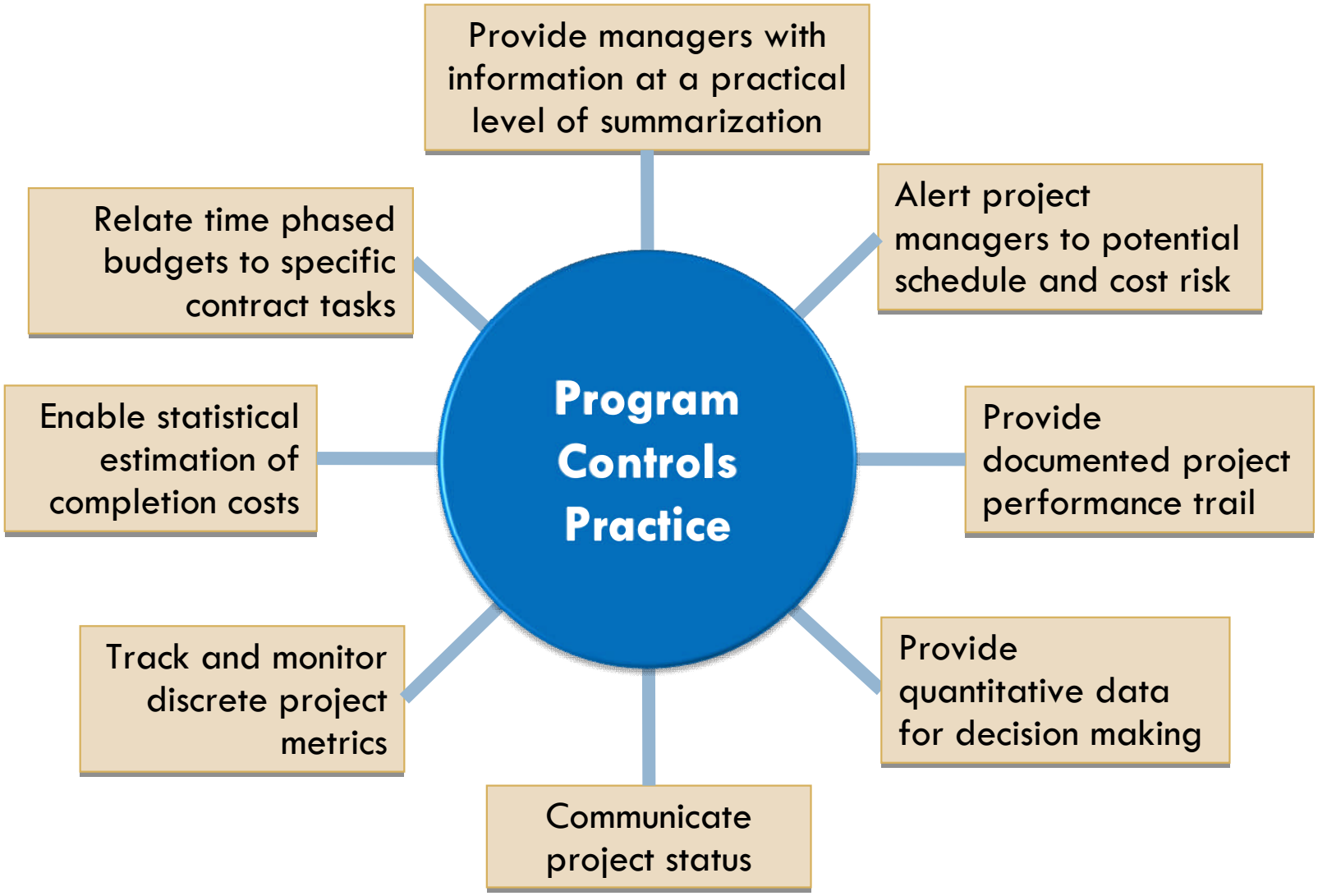
- Agile development?
  - Emerging requirements, implemented in iterations of 100% working solutions
- Agile Project Management?
  - Management processes emerge in response to project needs.
- Lean?
  - 6σ style management
  - Process improvement style management
- Lean and Agile acquisition and systems engineering?
  - Defense AT&L November – December 2010

Some Information Turns Out To Be Misinformation †

Popular Myths of Traditional Methods (Agile's Foil)	Actual Fact in DoD Programs
Assume all aspects can be defined prior to the start of work	5000.02 incremental milestones
Requirements are frozen	Rolling waves within each milestone
Change is discouraged	Change managed as capabilities evolve
Not good at managing the unknown	DoD defines technical and programmatic risk management
Provides comfort in a Plan	IMP / IMS evolves with rolling waves
Uncertainty begets uncertainty	Probabilistic risk management with specific handling strategies

† Borland Agile briefing, and typical of the Agile Community

These Business Management Practices Must Be Met …



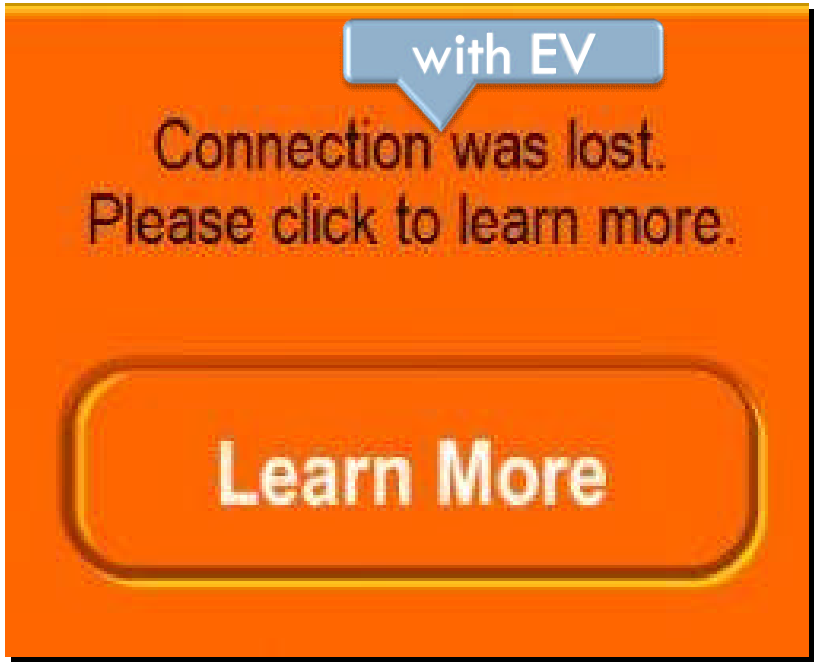
…By Connecting Agile and Earned Value Management

Our Path Forward For Today

- The core principles of EVM and Agile.
- We have everything we need for success, but we need to connect the dots.
  - Earned Value criteria
  - Agile software development methods
  - Technical Performance Measures
- How does Agile connect with EVM?
  - Principles of EV and Agile.
  - The acquisition lifecycle.
  - The Agile lifecycle.
  - Joining these two.
- Takeaways

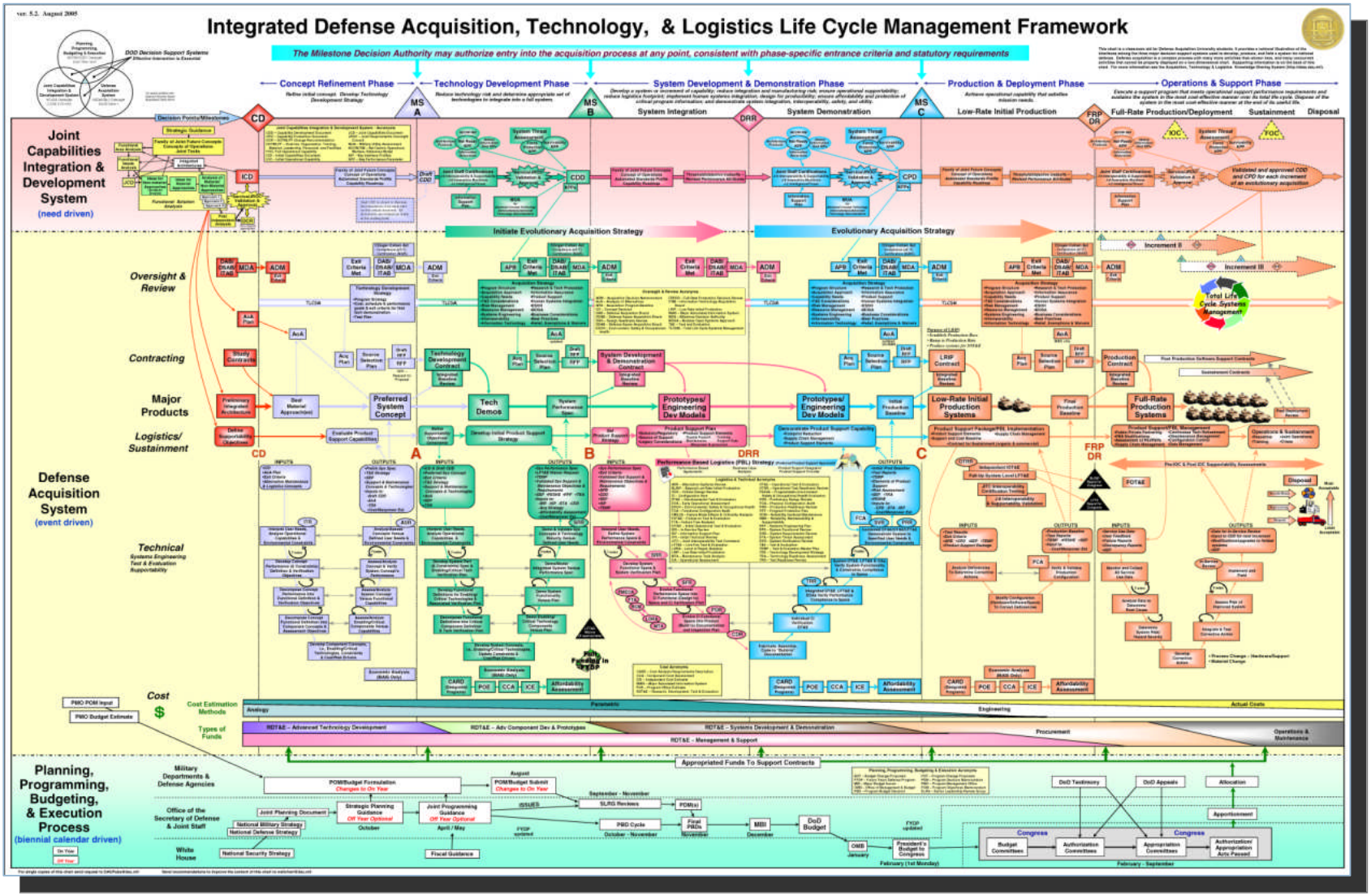
What's The Current State of EV?

- Program Managers many times make decisions on 45 day old data.
- No "official" connection to product quality, technical performance, or fulfilled capabilities.
- Even though the connection was there in C/SCSC, circa 1984.

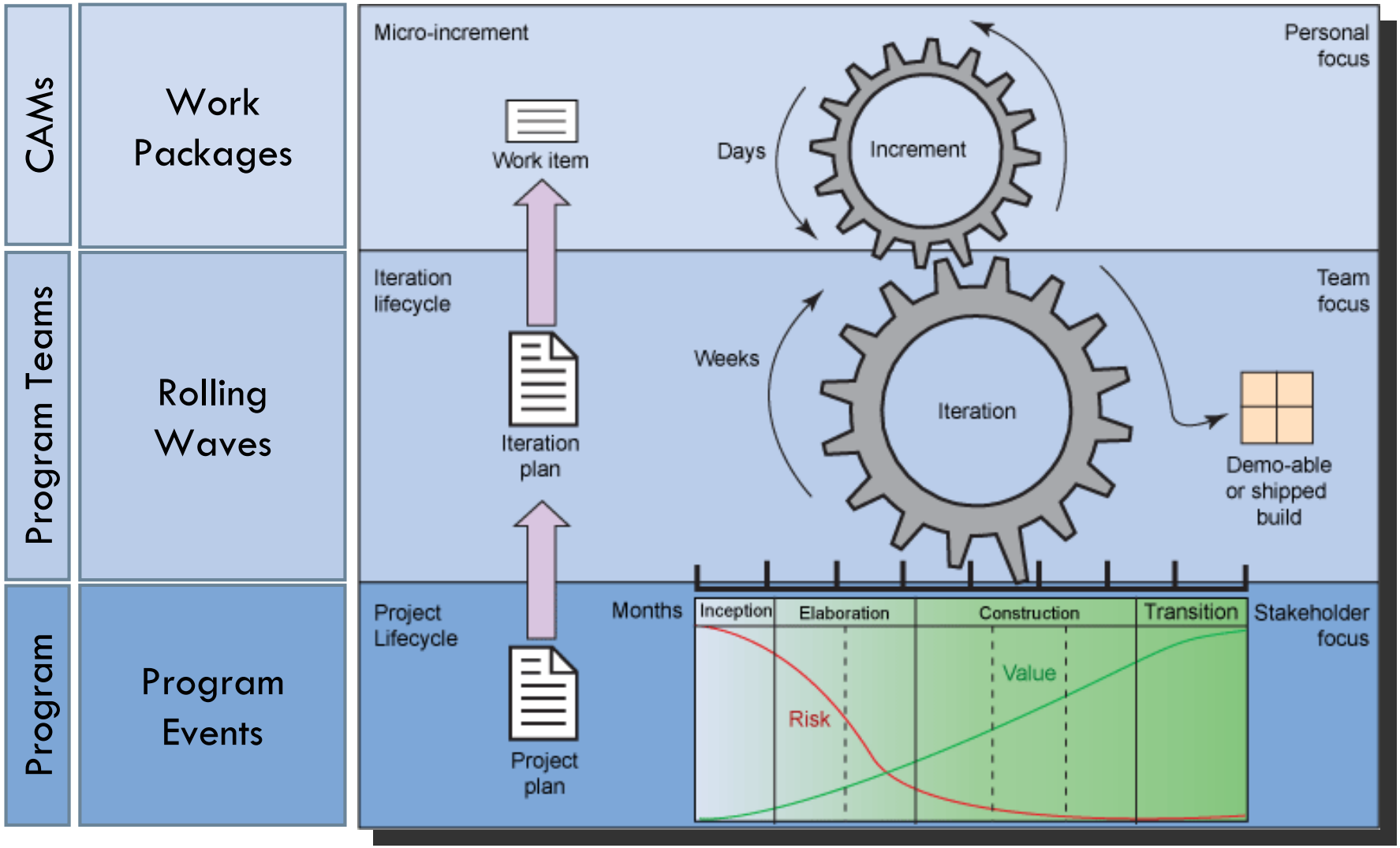


We've lost connection with the "real" program performance and replaced it with data

We Have The DoD Lifecycle And It's Iterative and Incremental – Sort Of



We Can Connect Agile With Earned Value Program Management Activities



11 EVM Criteria and Agile

Starting with the 32 criteria, let's use the core 11 criteria to connect with Agile.

Let's look at of the details of these 11.

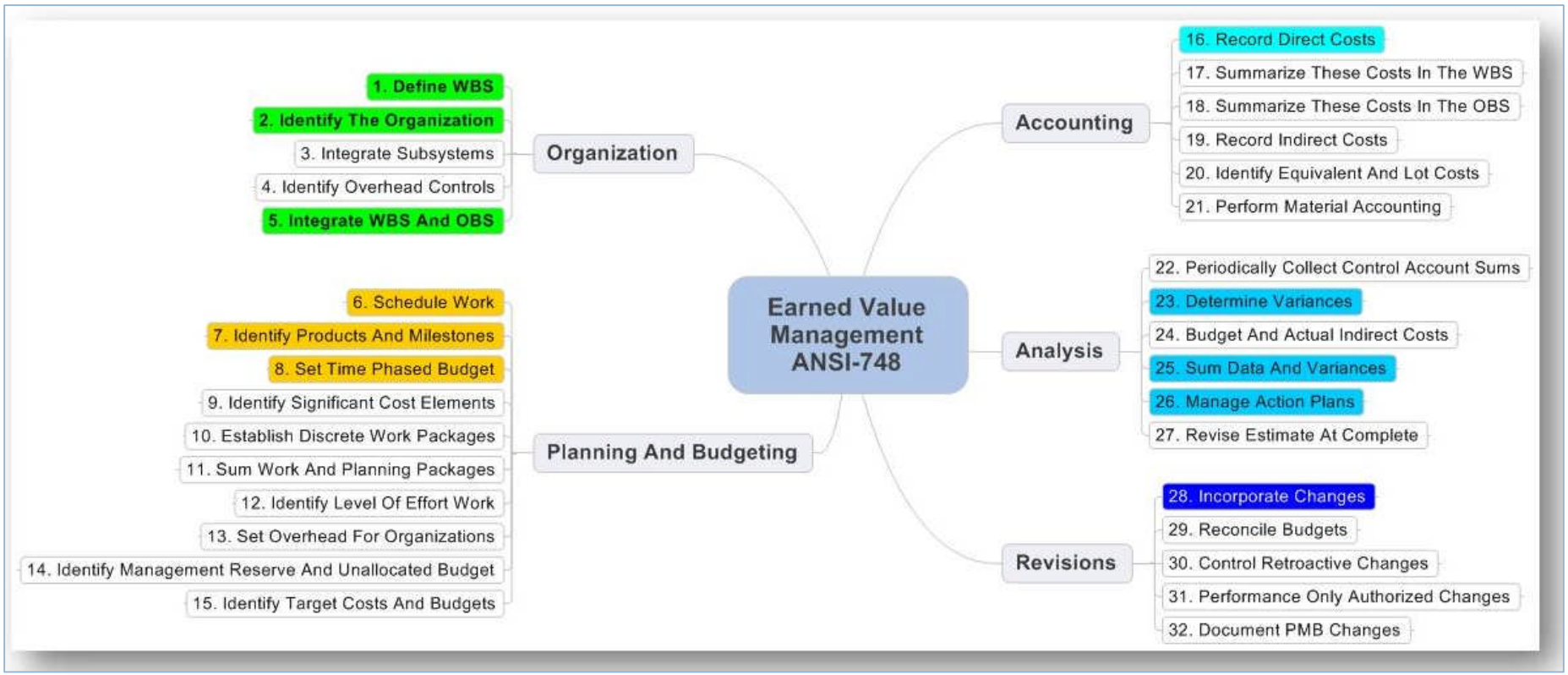
But before we start – the single most fundamental concept in Agile is the speed of feedback.

We must be able to answer the question –

How Long Are We Willling To Wait Before We Find Out We Are Late.

Our Path Starts With The 32 Criteria Of ANSI / EIA–748–B

- The 32 EVM Criteria are all designed to deliver value.
- These 11 are the basis of "connecting the dots."



Here's A Quick Look at the Connections

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#	EVM Criteria	Agile Approach
1	Define WBS	Features and Stories define tasks
2	Identify Organization	Self organizing teams
5	Integrate WBS and OBS	Self organized teams with a customer
6	Schedule Work	Iterations and Releases
7	Identify Products & Milestones	Working software at the end of iterations
8	Set time phased budget	Fixed length iterations and releases
16	Record direct costs	Fixed staff = Level of Effort
23	Determine variances	Velocity measures missed features
25	Sum data and variance	Missed features moved to next iteration
26	Manage action plans	Replan missed features, adjust velocity
28	Incorporate changes	Replan missed features, adjust velocity

2.1.a: Define Authorized Work Elements

Define the authorized work elements for the program. A work breakdown structure (WBS), tailored for effective internal management control, is commonly used in this process.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Work Breakdown Structure (WBS).	▪ Road Map & Release Plan consisting of Capabilities, Product Backlog & Iteration Backlog.
▪ WBS dictionary (may or may not be used, but a method to reconcile the statement of work to the WBS structure must be demonstrated).	▪ WBS dictionary: agile user stories are deliverables that you can measure “done” for, therefore user stories satisfy wbs dictionary.

2.1.b: Identify Program Organizational Structure

Identify the program organizational structure, including the major subcontractors responsible for accomplishing the authorized work, and define the organizational elements in which work will be planned and controlled.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Organization Breakdown Structure (OBS).	▪ CAM just builds a team as usual, but the team needs to be persistent, and not interchangeable parts.
▪ OBS intersections with the WBS.	▪ Team hierarchy definition with resources associated with their sub–teams. ▪ Done at the level of granularity to support the basis of estimate (BOE). ▪ Persistent teams are needed to apply throughput benchmarks to product backlogs to validate plans.

2.1.e: Integrate WBS and OBS

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Provide for integration of the program work breakdown structure and the program organizational structure in a manner that permits cost and schedule performance measurement by elements of either or both structures as needed.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Control accounts.	▪ Evidence that the CA meets the 90% discrete work rule. ▪ Defend schedule & cost performance at the CA level? ▪ Agile CA = one release. ▪ Actuals captured at the story level.
▪ Responsibility Assignment Matrix (RAM).	▪ Done at too high a level for the SW development approach to make a difference.
▪ Contract Performance Reports (CPRs), if applicable.	▪ Given an objective of X stories in iteration Y, completed stories are earned; all unearned return to backlog and a new ETC is developed from the benchmarks & backlog.

2.2.a: Schedule the Work

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Schedule the authorized work in a manner which describes the sequence of work and identifies significant task interdependencies required to meet the requirements of the program.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Integrated network schedules including master, intermediate (if any), and detailed schedules.	▪ CAM's agile roadmap becomes the auditable intermediate schedule demonstrating significant accomplishments (SA).
▪ MRP or ERP schedules, or planned order reports.	▪ Each task in IMS has associated resources.
▪ Control account plans (may be separate plans or detail schedules).	▪ CAM creates schedules compliant to DCMA 14 point assessment.
▪ Work authorization documents.	▪ Nothing different.

2.2.b: Identify Products and Milestones

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Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Integrated schedules including master, intermediate (if any), and detailed schedules that identify contract milestones and key events.	▪ Agile dev performance reporting follows the approved program system description ▪ Apportioned technical performance milestones to reduce risk & roll up intermediate technical performance.
▪ MRP or ERP production planned order reports.	▪ Not relevant to sw development.
▪ Control account plans (may be separate plans or detail schedules)	▪ Not relevant to sw development because we are reporting tasks as physical % complete, which will automatically roll up.

2.2.c: Set Time Phased Budget

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Establish and maintain a time–phased budget baseline, at the control account level, against which program performance can be measured. Initial budgets established for performance measurement will be based on either internal management goals or the external customer negotiated target cost including estimates for authorized but undefinitized work.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Control account plans.	▪ Time phased budget created for the current iteration(s) and future work.
▪ Summary level planning packages.	▪ Agile summary level planning documented in road map. Comprises capabilities, features and stories ▪ Agile planning packages driven by persistent teams with proven benchmarks.
▪ Performance Measurement baseline.	▪ Is there a target threshold for future work as described in a PMB? Within 10% OTB?
▪ Undistributed budget logs.	▪ Does this have anything to do with SW dev approach?
▪ Notification to the customer of an over–target baseline.	▪ Does this have anything to do with SW dev approach?
▪ Work authorization document.	▪ Does this have anything to do with sw dev approach?

2.3.a: Record Direct Costs

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Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Reconciliation of project costs with the accounting system.	▪ CAM would follow program direction on these. ▪ These are not impacted by sw dev approach
▪ Actual costs are reported at the control account level at a minimum.	▪ Not impacted by SW development approach.
▪ Reconciliation of subcontract reported actual costs to subcontract payments.	▪ Not impacted by SW development approach.
▪ Internal and external performance reports for subcontractors.	▪ Not impacted by SW development approach.
▪ Subcontractor control account plans, when utilized.	▪ Not impacted by SW development approach.

2.4.b: Determine Variances

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Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Variance analyses (budget based schedule variances and cost variances).	▪ Can track & report variances per the approved program system description
▪ Management action plans.	▪ Actionable recovery plans per issue.
▪ Updated schedule task completion and cost–at–completion forecasts.	▪ Scrum Agile has a POD and Plan for Iteration. ▪ CAM's monthly EAC reporting follows the approved program system description
▪ Project schedules and schedule analysis outputs.	▪ PM tracks the dynamic backlog, which will go up and down based on sponsor feedback

2.4.d: Summaries Variances

Summarize the data elements and associated variances through the program organization and/or work breakdown structure to support management needs and any customer reporting specified in the project.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Variance analyses.	▪ There is nothing in Agile's approach to SW development that precludes reporting variances at the WP level. ▪ Agile is more dynamic than EVM so variances are less the issue than the evolving baseline, as approved in governance. The sponsor will want to track accumulating business value and variances to total product needs.
▪ Schedule and cost performance reports.	▪ Similar – but measures of performance not usually in dollars
▪ Management action plans.	▪ Similar – but less formal. Collaborative discussion of what actions to take include the customer.
▪ Updated schedule and cost forecasts.	▪ Similar – but less formal. Planning processes include the customer.

2.4.e: Implement Management Plan

Implement managerial action taken as the result of earned value information.

EVMIG Objective Evidence	Agile Objective Evidence
▪ To–Complete Performance Index (TCPI).	▪ TCPI = Work Remaining / Cost Remaining ((BAC – BCWPcum) / (EAC – ACWPcum)). In Agile, work remaining is the product backlog. Backlog is BAC – BCWP.
▪ Independent completion estimates.	▪ No longer used in 2010
▪ Risk management data and similar metrics.	▪ Qualitative Risk Burn–down Chart (risk rating)
▪ Management action plans and review briefings.	▪ Agile approach called Commitment Based Planning – where the SCRUM team makes and meets its time phase BCWS commitments. ▪ Any team, when behind, gives voice to the customer when evaluating/reweighting the triple constraint.
▪ Variance analyses.	▪ This is an issue of cost mgmt and system description would define when and where team members would bill

2.5.a: Incorporate Changes (1)

Incorporate authorized changes in a timely manner, recording the effects of such changes in the budgets and schedules.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Contractual change documents.	▪ Bug reports, new user stories, but not necessarily cost sized. ▪ User stories above baseline are tracked as new scope (with a valid BOE) and require BCWS
▪ Change control logs (management reserve, undistributed budget, performance measurement baseline, and contract budget base).	▪ New or materially altered features or stories are changes.
▪ Control account/work package/planning package plans.	▪ Product and iteration backlogs are frozen during the development period

2.5.a: Incorporate Changes (2)

Incorporate authorized changes in a timely manner, recording the effects of such changes in the budgets and schedules.

EVMIG Objective Evidence	Agile Objective Evidence
▪ Master schedules, intermediate schedules (if any), and detailed schedules.	▪ Iterations and evolutionary planning at the detailed levels merges with the end to end planning for agile.
▪ Statement of work, WBS, and WBS dictionary.	▪ Customer owner and Planning processes identify requires work and its description.
▪ Work authorization documents.	▪ Planning sessions, authorize a set of Stories to be developed during the iteration.
▪ Management reports (contract performance reports or other applicable management reports).	▪ Big Visible Charts, “sticky notes” display progress to plan for the agile team.

Step–by–Step for Connecting Earned Value Management with Agile†

- **Define DONE** – then define the Accomplishments needed to reach done. And the Criteria by which these Accomplishments will be measured. Only then define the work effort needed to fulfill the Criteria.
- **Time Boxes** – these are fine for some things. But the Basis of Estimate for what can be accomplished within the time box still needs to be performed.
- **Don't add slack** – slack needs to be somewhere. It's best to make it explicit in the schedule. Before the deliverable. This "buffer" is best determined using Monte Carlo knowing the probability distributions the work efforts.
- **Defer Decisions** – well maybe. Maybe Defer Commitments is a better term. Decisions must be made all the time. Waiting too long for a decision simply delays the project.
- **Discipline** – is the glue that holds the project together.
- **Reduce Cycle Time** – ask "how long am I willing to wait to find out I'm late, over budget, or the product doesn't work as specified?" Use that time as a guide for the cycle time. The cycle time can be too short as well. This results in thrashing.
- **Keep the Pipeline Short and Thin** – never confuse effort with results. Focus on deliverables.
- **Limit Task Switching** – multitasking beyond two tasks has been shown to reduce effectiveness. Don't do it.
- **Prevent Sustained Overtime** – if you're using overtime, you're not managing the schedule or the deliverables. "No Surprises" is the goal.
- **Separate Urgent v. Important** – define the value of the deliverables. Let that drive urgent versus important.

† Adapted from Jurgen Appelo's Blog "10 Principles of Agile Time Management," http://www.noop.nl/2008/06/10–principles–of–agile–project–time–management.html

A Take Away†

… As the PM community proceeds to build an integrated program management model, working with other functional communities, … , other program management processes will be identified that should be integrated.

As in evolutionary or spiral development, each step towards integration will both make the next step more achievable, and will make the next step clearer..

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Our Final Message

But before we end – the single most fundamental concept in Agile is the speed of feedback.

We must be able to answer the question –

How Long Are We Willing To Wait Before We Find Out We Going To Be Late.

How can we know that we are on-budget, we're on-schedule AND it works