Estimating and Reporting Agile Projects using the SRDR and Earned Value Management
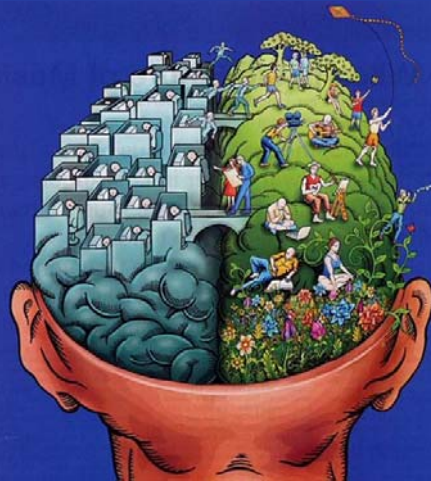
Glen B. Alleman
Thomas J. Coonce

PSM Users' Group 2017
Measurement: Measurement in a Complex Environment
12–16 June 2017, Crystal City, Virginia

What Do We Mean When We Read the NDIA "An Industry Practice Guide for Agile on Earned Value Management Programs?"

Do Agile Agile Practices
- Scrum
- eXtreme Programming
- DSDM
- Crystal
- Prince2 Agile

Being Agile Agile Mindset
- Emergent Requirements
- Iterative development
- Incremental deployment

Doing Agile is NOT the Same as Being Agile

2

Why We're Here? Told as an Agile *User Story*†

- As a \<type of user\>, I want \<some goal\> so that \<some reason\>

Before Contract Award

- As a *Government Technical Software Manager* I want *to Properly Estimate the Features in the CONOPS* so that *I have a Credible Baseline*

After Contract Award

- As a *Government Technical Software Manager* I want *assure that Features in ConOps can be delivered within Cost and Schedule* so that *we're delivering capability according to plan*

† User Stories Applied for Agile Software Development, Mike Cohn, Addison Wesley

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Some Understanding Before We Start

- SRDR is applicable to all MDAPs greater than $25M.

- For Earned Value Management to be applicable, the program is Large compared to the typical software development project,
  - $20M for self-assessment (SA).
  - $100M for DCMA Validation (VR).

- For typical commercial Agile development effort, a small team of 5 to 7 developers – at typical burden rates – runs $600K to $800K (Burdened) a year for the team.

- The typical commercial agile project is 30 to 125 times *smaller* then the entry points of an EVMS IAW 748-C.

- So Agile + Earned Value Management starts at the Enterprise and *At Scale* environment. In this domain, process compliance is king.

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Developing a Credible Plan Before Contract Award

At this point in time, we have little to base estimates on other than past similar projects.

- Decomposing the ConOps into Capabilities and Features

- Background on Agile Software Development (Scrum)

- NDIA framework for integrating EVM with Agile

- Start by estimating *Capabilities*

- What's the purpose of Estimates on Agile programs

- Story Points are Not meaningful measures of Time, Cost, or Physical Percent Complete

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Decompose of the ConOps into Capabilities and Features

Source: David Bulkin, Lithespeed.com

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Some Understanding of Agile Software Development (1)

- Product Roadmap defines what Capabilities are need.

- Release Plan states when Features are available to fulfill the Capabilities.

- Product Backlog contains Features to be implemented in Sprints.

- Stories define the outcomes for the Features.
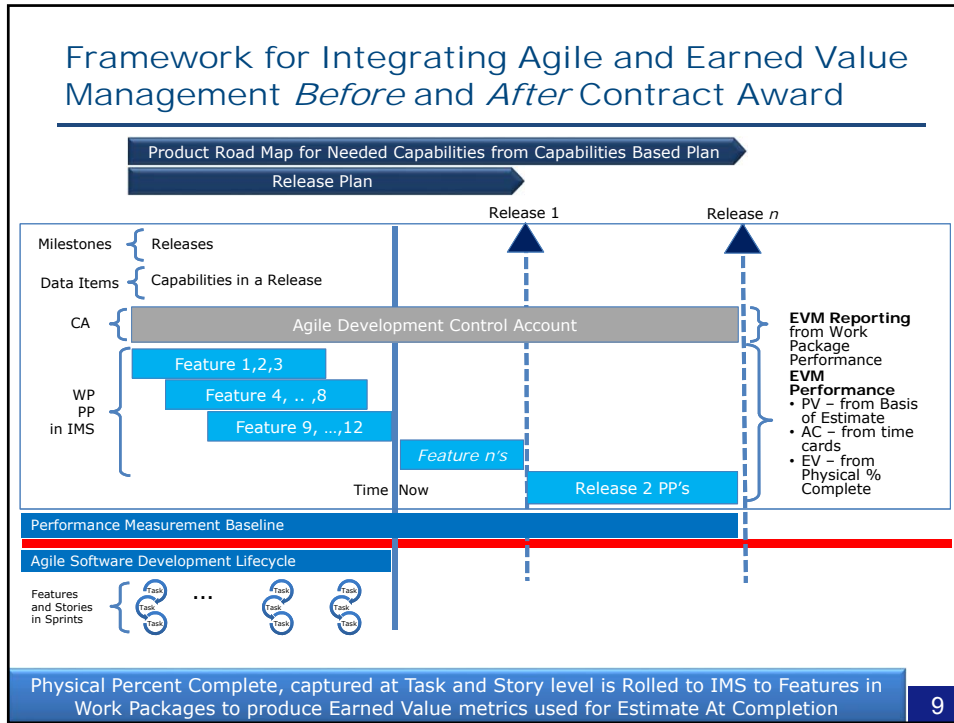
- Tasks define the work to produce the Story.

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Some Understanding of Agile Software Development (2)

- Physical Percent Complete defined by the 100% completion of a Story with it's exit criteria.

- BCWS is the flat spread of the Labor for the Sprint.

- BCWP = BCWS × Physical Percent Complete.

- Estimating in Agile answers the question *Can we deliver the Features for the Budget*?

- Estimating in Traditional EVMS answers the question *What is the Cost for the needed Features?*

8

Framework for Integrating Agile and Earned Value Management *Before* and *After* Contract Award

Product Road Map for Needed Capabilities from Capabilities Based Plan

Release Plan

Release 1   Release *n*

Milestones { Releases

Data Items { Capabilities in a Release

CA   Agile Development Control Account

EVM Reporting from Work Package Performance

WP PP in IMS
- Feature 1,2,3
- Feature 4, .. ,8
- Feature 9, …,12

Feature n's

Time Now   Release 2 PP's

EVM Performance
- PV – from Basis of Estimate
- AC – from time cards
- EV – from Physical % Complete

Performance Measurement Baseline

Agile Software Development Lifecycle

Features and Stories in Sprints { Task Task Task   …   Task Task Task   Task Task Task

Physical Percent Complete, captured at Task and Story level is Rolled to IMS to Features in Work Packages to produce Earned Value metrics used for Estimate At Completion

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Our Notional Program starts with Capabilities Based Planning

Our needed Capabilities are provided by a Software Intensive System of Systems (SISoS).
This program is a software program, we can buy the hardware out of a catalog

Example of Capability Statements for a Surveillance Quadcopter

1. Be commanded to autonomously fly to an area of interest.

2. Loiter in the area of interest for 2 hours.

3. Discover what's going on in an area of interest.

4. Redirect to new area of interest from Ground Station.

5. Transmit information to ground station in real-time.

6. Return home automatically or when commanded.

These Capabilities will be Implemented by Features in an emergent, agile manner, not constrained by early requirements

Capabilities Based Planning is about MOEs and MOPs NOT technical requirements first. JSA-TP-3-CBP

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The primary purpose of software Planning, Budgeting, and Estimating on Agile software programs is to determine whether a project's *targets* are *realistic* enough to allow the project to be controlled to meet them.

— *Steve McConnell* —

This is the inverse of the Estimating processes on traditional EVM programs, where the Baselined work is summarized to produce the BCWS.

From the Government's point of view, On Agile Programs, BCWS is flat spread across each Sprint that implements each Feature in each Work Package in each Control Account.
On Agile Programs, we need to know if we have enough money and time to deliver the *Capabilities* without knowing the detailed Requirements.

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Top Level Agile Acquisition Process

Prior to Contract Award, the Government develops a Credible Estimate based on a desired Product Roadmap for the needed Capabilities to Accomplish the Mission

After Contract Award, the Government iterates with the Contractor on the Product Roadmap as the Features emerge that fulfill the needed Capabilities

Building the Governments' Credible Plan Before Award

- Using reference class data,

- Build Government Product Roadmap, and

- Build Government Release Plan showing what Capabilities are contained in what Release.

How Do We Estimate the Capabilities *Before* we Know the Needed Features?

- Start with a *Notional* plan of what Features are contained in *Capabilities* from past work.

- Use actual hours for these Features to develop a Reference Class (past SRDR).
  - We need a Feature Breakdown Structure just like the WBS in MIL-STD-881C

- Use the Reference Class for model emerging Features.

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Starting Point for Estimating Agile Projects

- For a proposed future agile application for a given operating environment and application domain and stated features, the estimator should be able to query on a standardize feature list and obtain:
  - Actual staff hours to produce the feature
  - Actual duration to produce the feature
  - Extent of software reuse and sources
  - Extent of use of automated tools
  - Team experience

- For each feature, estimator would array historical dependent effort and durations and other attributes and compare to targeted feature

- For proposed new feature with given planned library and automated tool use, find nearest neighbor with similar reuse and tool use and extract effort and duration

- If no knowledge of reuse and automated tool use, use the means

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Executing the Program After Contract Award

- Using reference class data,

- Compare actual performance with planned performance, and

- Identify corrective actions needed to keep the program on plan.

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Story Points are **NOT** Meaningful Measures of Time, Cost, or Physical Percent Complete
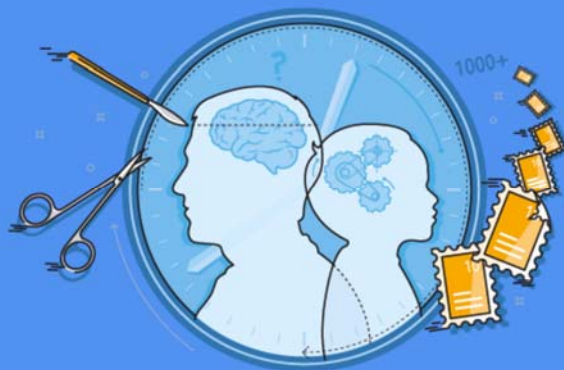
In Agile,

Story Point-based measures are about the **_Relative_** effort the work will take, not the **_Actual_** effort or duration.

The customer needs to know *how much* and *how long*.

https://www.mountaingoatsoftware.com/blog/its-effort-not-complexity

mountaingoatsoftware.com

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9

Let's Pause to Address the Cardinal and Ordinal Estimating Problem

- When we use a measure of something we need to know if it is *Cardinal* or *Ordinal*.

- *Ordinal* measures tell us the relative difference between items.
  - Uncle Scrooge is *relatively rich* compared to Huey, Dewey, and Louie is an *Ordinal* measure.

- *Cardinal* measures are numbers that say *how many* of something there are, they are counting numbers – one, two, three, four, five.
  - Uncle Scrooge has $1,250,000,000 dollars of Gold

- In Project Performance Management we use Cardinal numbers, measured in Dollars, Hours, Technical Performance compliance.

- Story Points are **NOT** a unit of measure used in Project Performance Management in the DI-MGMT-81861 IPMR

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A Caution for Using Story Points to Measures Anything Beyond a Single Feature on a Single Team

Ordinal numbers **ONLY** have *meaning* for their current use – unless calibrated to a reference that does not change over time

NEW CUYAMA
Population 562
Ft. above sea level 2150
Established 1951
TOTAL 4663

Without Calibrated values, the numbers have no meaning when collected at higher levels of the program – WP's and Control Account.
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10

Ordinal Story Points Cannot Be The Basis of Higher Than A Single Feature

Release 1 ● ∑ of SP's

These are **Not** the same units of measure between Features – Uncalibrated SP's

Feature 1 ● ∑ $F_1(SP)$ • • • Feature *n* ● ∑ $F_n(SP)$

Story 1 ●
Story 2 ●
Story 3 ●
Story 4 ●
Story 5 ●
Story 6 ●

Team 1's Uncalibrated Ordinal SP estimates

Story 1 ●
Story 2 ●
Story 3 ●
Story 4 ●
Story 5 ●
• • • Story 6 ●

Team 2's Uncalibrated Ordinal SP estimates

- At the Story level, relative effort defines individual estimates.
- At the Feature level, lower level SP's don't have the same *unit of measure* in the way Dollars do.
- When Features summed to the Release, relative measures do not provide basis of Physical Percent Complete.

Using Ordinal (uncalibrated values) outside the domain of agreement prevents comparison of higher levels on the program. *My* Story Points aren't *Your* Story Points. **21**

Stories and Story Points are NOT Measures of Cost, Schedule, or Performance

… Beyond a single Scrum Team, with calibrated Story Points for their own usage and need …

- Story Points are *Ordinal* numbers – relative measures of effort or complexity defined by the Scrum Team members for a specific Sprint, Feature, and perhaps a Release.

- Story Points are not scope, they are calibrated to Time and Money outside an individual Scrum Team.

- Counting Story Points is like counting *Tasks* in the IMS
  - We have 40 tasks to do for this delivery which is 9 weeks long (3, 3 week Sprints).
  - We've done 20 Tasks so far.
  - Are we 50% complete for the planned task work?
  - Not likely unless each Task is of the same effort and duration.

Let's keep reminding ourselves Story Points are *Ordinal* measures.
Useful for *relative sizing* but not sizing in units of dollars and hours. **22**

In this afternoon's workshop we're going to lead participants to …

- Develop the Performance Measurement Baseline for the the needed Capabilities

- Develop the Features that fulfill those Capabilities.
  - Product Roadmap
  - Release Plan

- Measure progress to plan using EVM data
  - Physical Percent Complete at the Feature level in the Product Roadmap

- Develop scenarios for statusing and forecasting the program

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Workshop Agenda

- Present a Features of a notional UAS with a Release Plan

- Explain the principles of measuring Physical Percent Complete

- Demonstrate this on the notional program, with two scenarios

- Lead the students to evaluate progress and EAC using two scenarios

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+

After Contract Award

The contract for the quadcopter has been award.

Now the government needs assurance that progress to plan be being made in units of measure meaningful to the decision makers

- Agile estimating starts with Capabilities Based Planning

- The Capabilities of the Quadcopter and the Features for each Release in the Product Roadmap

- A quick overview of Scrum

- 10 Step Integration of Agile on EVM Programs

- 5 Baseline Change Scenarios

- 7 Forecasting Scenarios

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Example Capability Statements for Surveillance using Quadcopter

1. Be commanded to autonomously fly to an area of interest.

2. Loiter in the area of interest for 2 hours.

3. Discover what's going on in an area of interest.

4. Redirect to new area of interest from Ground Station.

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Our Program starts with Capabilities Based Planning

Our needed Capabilities are provided by a Software Intensive System of Systems (SISoS).
This program is a software program, we can buy the hardware out of a catalog

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Product Roadmap for the Quadcopter

Release 1	Release 2	Release 3
Features	Features	Features
• Autonomously takeoff • Accept mission coordinates • Fly to mission coordinates (are of interest) • Loiter over area of interest • Pilot controlled return to home	• Collect basic surveillance data over area of interest • Transmit data to ground station	• Accept ground station redirection to new area of interest • Collect advanced surveillance data • Autonomously return home on command

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Product Roadmap for the Quadcopter

Release 1	Release 2	Release 3
Features	Features	Features
• Autonomously takeoff • Accept mission coordinates • Fly to mission coordinates (are of interest) • **Loiter over area of interest** • Pilot controlled return to home	• Collect surveillance data over area of interest • Transmit data to ground station	• Accept ground station redirection to new area of interest • Collect advanced surveillance data • Autonomously return home on command

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15

Loiter Over Area of Interest

As a <type of user>, I want <some goal> so that <some reason>

- Discover topology of the terrain at the area of interest to avoid collision with terrain

- Discover the flying conditions at the area of interest to assess stability of platform

- Define the loiter pattern given the terrain at the area of interest (race track pattern– figure 8's) to confirm loiter time possible

- Determine altitude for best surveillance to match needed resolution

- Determine in real-time, the remaining loiter time with fuel return to ground station, to assure mission can be accomplished.

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+ Product Roadmap for the Quadcopter

Release 1	Release 2	Release 3
Features	Features	Features
▪ Autonomously takeoff ▪ Accept mission coordinates ▪ Fly to mission coordinates (are of interest) ▪ Loiter over area of interest ▪ Pilot controlled return to home	▪ **Collect surveillance data over area of interest** ▪ Transmit data to ground station	▪ Accept ground station redirection to new area of interest ▪ Collect advanced surveillance data ▪ Autonomously return home on command

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Collect surveillance data over area of interest

As a <type of user>, I want <some goal> so that <some reason>

- Collect and store EO/IR, to look for humans walking on the ground for threat assessment.

- Collect and store SAR data for stationary or moving equipment on the ground for terrain assessment.

- Collect and store SIGINT and ELINT data to classify radiation sources (radar and target tracking) to identify potential targets for Electronic Warfare attack (jamming) for building Electronic Order of Battle (EOB).

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+ Product Roadmap for the Quadcopter

Release 1	Release 2	Release 3
Features	Features	Features
▪ Autonomously takeoff ▪ Accept mission coordinates ▪ Fly to mission coordinates (are of interest) ▪ Loiter over area of interest ▪ Pilot controlled return to home	▪ Collect surveillance data over area of interest ▪ Transmit data to ground station	▪ Accept ground station redirection to new area of interest ▪ **Collect advanced surveillance data** ▪ Autonomously return home on command

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Collect Advanced Surveillance Data

As a <type of user>, I want <some goal> so that <some reason>

- Collect Full Motion Video (FMV) Data to identify moving targets and their paths.

- Compress and store FMV data to wait for best transmission opportunities.

- Transmit FMV data when maximum bandwidth is available.

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Quick Overview of Scrum Software Development

- Product Roadmap defines what Capabilities are need
- Release Plan states when Features are available to fulfill the Capabilities
- Product Backlog contains Features to be implemented in Sprints
- Stories define the outcomes for the Features
- Tasks define the work to produce the Story
- Physical Percent Complete defined by the 100% completion of a Story with it's exit criteria
- BCWS is the flat spread of the Labor for the Sprint
- BCWP = BCWS × Physical Percent Complete

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Critical Success Factors for Agile and EVMS

- Every Story, that implements at Feature must have *testable* exist criteria ...
  - This means we MUST know what DONE looks before starting the work.
  - This knowledge MUST be in units of measure meaningful to the decision makers.
  - Measures of Effectiveness – Operational measures of success that are closely related to the achievements of the mission or operational objectives evaluated in the operational environment, under a specific set of conditions.
  - Measures of Performance – characterize physical or functional attributes relating to the system operation, measured or estimated under specific conditions.

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10 Steps to Integration of Agile on Earned Value Management Programs

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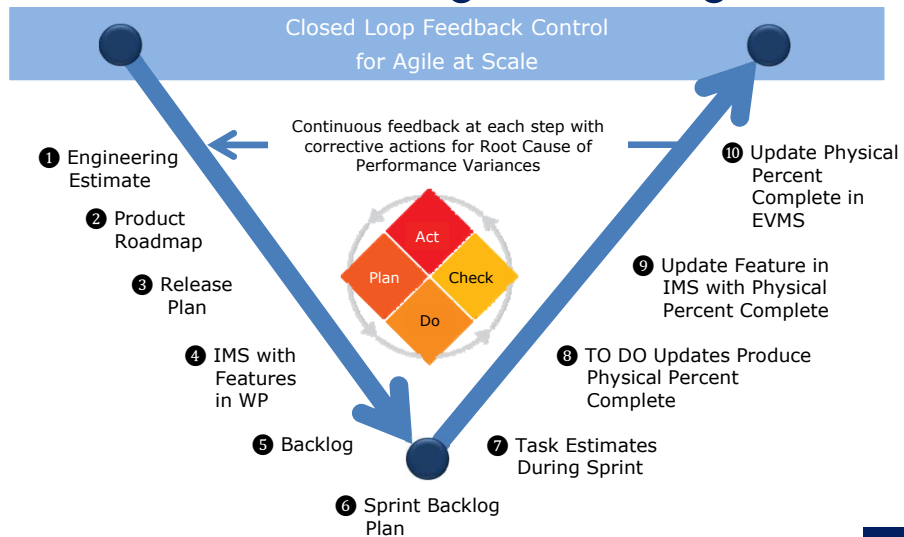
10 Step Integration of Agile with Earned Value Management

From Estimate to Backlog	+	From Sprint to Status

From Estimate to Backlog

❶ Engineering Estimate of requested Features to deliver needed business Capabilities for needed budget and time

❷ Roadmap of those Features laid out in needed order

❸ Release Plan for those Features

❹ IMS with Features in Work Packages with PV for FTE and ODC

❺ Features in the Backlog in Agile Development System

From Sprint to Status

❻ Sprint Plan for Features and Stories

❼ Task Estimates of Stories and Tasks During Sprint

❽ TO DO Updates During Daily Standup

❾ Features in IMS statused with Physical Percent Complete from Rally

❿ Status from IMS sent to Cobra®

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❶

Engineering Estimate

Earned Value	+	Agile

Earned Value

1. Decompose needed Capabilities into Features

2. Estimate effort in hours to deliver the Feature

3. Determine uncertainties around that estimate
   1. Reducible uncertainty
   2. Irreducible uncertainty

4. Model these uncertainties with Crystal Ball® to 80% confidence
   - Use Triangle distribution if actual distribution not known

5. Establish Change Control process for updates to this estimate as the project progresses

Agile

1. Assess past performance for similar Features used for estimates

2. Rank Feature with Ordinal measure if needed (Story Points)

3. Focus of Cardinal estimates in hours

4. Assure Features include all exit criteria and risks

5. Assure Features have minimal dependencies

6. Define sequence of deliverables, in preparation for Product Roadmap

40

②

Product Roadmap

Earned Value	**+**	Agile

Earned Value

1. In the WBS Dictionary, define Capabilities of each Feature (DoD = definition of done) with measures of:
   - Effectiveness
   - Performance
   - Technical
   - Key Performance Parameters
2. Assign PV in Hours for FTE to each period of performance to the Features in the assigned Work Package

Agile

1. Build Roadmap from ROM and Engineering Estimate for sequence of Features accepted by customer
2. Put the Features in the proper order in the Roadmap in Rally
3. Publish Roadmap for the Scrum Team in hardcopy

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③

Release Plan

Earned Value	**+**	Agile

Earned Value

1. In the IMS, layout and sequence Features in Work Packages for the number of Sprints to produce each Feature
2. Establish Change Control for modifying the Release Plan in the IMS as the project progresses

Agile

1. Assign Features to Releases
2. Code this information in Rally
3. Update Roadmap with Release Information for each Feature from the final accepted ROM

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④

IMS with Features in Work Packages

Earned Value	+	Agile
1. Obtain hours, core and non-core, and LCAT by Feature from the ROM 2. Validate PV against the Release Plan 3. Baseline Work Packages with PV and period of performance for each Feature		1. Feature Period of Performance shown in with Release Plan 2. Original Estimates from ROM recorded in Backlog traceable to IMS

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⑤

Product Backlog

Earned Value	+	Agile
1. The Features in the Backlog are traceable to the Engineering Estimate and to the Planned Value in the PMB 2. Use the Backlog as source material for Roadmap, along with the PV for each Feature ▪ Story Points can be assigned in the PBL for prioritization purposes		1. Backlog built from Roadmap using Features from Engineering Estimate and any further decomposition into Stories 2. Effort estimate in Hours, can be augmented with Story Points to improve confidence in proper estimate

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⑥

Sprint Backlog

Earned Value	+	Agile
1. Confirm PV above the line is in lock step with the work planned below the line. 2. Confirm FTE spread for Period of Performance for Work Packages in the IMS		1. Capacity for work is primary Sprint Planning process 2. Confirm needed skill set to complete the work and remove blocking factors within Sprint

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⑦

Task Estimating for the Sprint

Earned Value	+	Agile

1. Confirm TASK EST is still proper value for the Feature being executed in the Sprint
   ▪ If not, update the Forecast in IMS and Cobra
 	
2. The role of the Planner is to update the Forecast in the IMS and Cobra to reflect Sprint and Feature planning and execution
   ▪ This foot and ties the Forecast with the Physical Percent Complete
   ▪ They are complements of each other
		1. Decompose Features into Stories and Tasks
		2. Estimate Tasks in TASK EST field in Rally
		   ▪ Once Sprint starts this field is frozen
		   ▪ Initially TO DO = TASK EST
		3. When Sprint starts, update TO DO field as work progresses
		   ▪ TO DO goes down as work is completed
		   ▪ TO DO goes up as new more work is discovered
		4. Update FEATURE FORECAST if
		   ▪ Current estimated work > TASK EST
		   ▪ Remaining work is expected to take longer than the initial estimate
		   ▪ Note: Forecast should only include in-scope changes

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⑧

TO DO Updates of Sprint Work

Earned Value	+	Agile
1. The updated TO DO from the Daily Standup is used to calculate Physical Percent Complete 2. This is used to calculate Percent Complete on a daily basis, as well as at month end: - Current performance is available daily - This reporting path assures accurate month end status that relies on TO DO updates from the Daily Standup		1. TO DO should be updated at the Daily Standup 2. When the estimated effort changes to be different than baselined in the TASK EST field – TO DO is updated 3. TO DO value - Goes down as the work is completed - Goes up when new work (in scope) is discovered for the Task, Story, therefore for the Feature

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⑨

Feature Physical Percent Complete in the IMS

Earned Value	+	Agile
1. No need to ask anyone what the status is, Rally has the status at the lowest level of the project – live on a daily basis 2. Feature Physical Percent Complete values are imported to the IMS and used to status Features in Work Packages 3. Use the custom report to extract performance from Agile in the form of Physical Percent Complete 4. Feature ***Physical Percent Complete*** on the report is a rollup from Tasks to the Feature level		1. The Physical Percent Complete values are exported from Rally in a custom report 2. Feature Physical Percent Complete is calculated from the rollup of the TO DO field and the Feature Forecast

$(\Sigma \text{ TASK EST} - \Sigma \text{ TO DO}) / \text{Feature Forecast}$

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Earned Value Calculated by Physical Percent Complete

□ EIA-748-C, page 1, bullet 5 says ...
Objectively assess accomplishments at the work performance level – Tasks in the Sprint.

- Story Points **CAN** be used for relative assessment in prioritizing work in the Product Backlog – *Ordinal* numbers.

- Hours used to define actual effort and duration during *Story Time, Tasking*, and *Sprint Execution* – Cardinal numbers.

- Mixing the Story Points with Hours is fine when prioritizing the work in the Product Backlog and Sprint Backlog.

- Measuring progress to plan needs to be with **Cardinal** values meaningful to the decision makers.

- The IPMR (DI-MGMT-81861) has **NO** units of measure in Stories or Story Points.

- Measures of Physical Percent Complete **MUST** used Cardinal Values as well.

Story Points are useful for prioritizing work, we don't need them for calculating Physical Percent Complete. Because we have hour estimates on the contract.

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Physical Percent Complete During Sprints

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⑩ Earned Value Updates of Work Packages in EVMS

Earned Value	+	Agile

1. Update ETC in Cobra
 	
  ▪ Periodically update ETC by LCAT for Work Packages in Cobra
 	
  ▪ Verify that the resulting ETC hours still match the IMS and the Sprint work to do
 	
2. Update EV in Cobra
 	
  ▪ Physical Percent Complete from Agile is also used in Cobra
 	
  ▪ Based on the Business Rhythm, update Physical Percent Complete for Work Packages in Cobra
 	
  ▪ Calculate EV
		1. Confirm reported Physical Percent Complete in Cobra® *foot and ties* with Physical Percent Complete in Rally to acceptable degree of accuracy and precision
		
		  ▪ This is an *eye ball* assessment, the number may or may not be *exactly* the same, so *close enough* is a value judgement of the Planners and PM
		
		2. As part of the EV analysis processes, provide performance assessment and suggested corrective actions

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5 Baseline Change Scenarios

❶ Feature in PMB not opened and moved to new work package.

❷ Open feature incomplete at end of planned Sprint.

❸ Feature in current release moved to another release.

❹ Planned initiative and resulting feature removed from baseline.

❺ Feature completion criteria updated with additional functionality.

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❶ Feature in PMB Not Opened and Moved to New Work Package

Scenario	PMB Action	Agile Action
▪ Feature in the PMB Work Package is not open and has not started . ▪ The Feature is not needed in the current release. ▪ Customer approves moving the Feature to another Release.	▪ Replan the PMB's work package budget (BCWS) to a Planning Package in a future Release. ▪ If the baseline start for the Feature is inside the program's Freeze Period, customer must approve the baseline change.	▪ Feature and related Stories are returned to the Backlog and assigned to a future Release. ▪ The Planning Package for that release is updated. ▪ Customer approves the moving of the Feature to the future Release.

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❷ Open Feature Incomplete at end of Planned Sprint

Scenario	PMB Action	Agile Action
▪ Feature in an Open Work Package is 30% complete. ▪ The Sprint completion date arrives and Feature is not complete. ▪ The Sprint completes without this Feature.	▪ Keep Work Package open and report a schedule variance ▪ Possibly report a Cost Variance as well ▪ Work Package stays open until all planned work is completed.	▪ Unfinished work returned to Backlog and planned for future Release ▪ Work stops at end of Sprint

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③ Feature in Current Release Moved to Another Release

Scenario	PMB Action	Agile Action
- Feature in current Release reprioritized and moved to another Release. - Planned Feature is exchanged for a different Feature from the Backlog of similar size placed in a future release. - Planned Feature placed back on the Backlog.	- Overall budget and schedule is unchanged. - This is a Replan of the PMB. - Budget for the Feature follows the Feature.	- Features and related Stories reassigned to a WP and Release PP - WP and PP traceability updated in the PMB. - Backlog updated with planned Release removed

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④ Planned Initiative Removed from Baseline

Scenario	PMB Action	Agile Action
- Initiative removed from baseline through a contract change. - Change impacts a Feature - Removed Feature is in an open Work Package	- Baseline change, because Scope has changed. - Close Work Package with unfinished work. - Unclaimed BCWS moved to Undistributed Budget (UB)	- Unfinished Features returned to Backlog - Remove Feature and any Stories from Backlog

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5 Feature Completion Criteria Updated with Additional Functionality

Scenario	PMB Action	Agile Action
▪ Exit criteria for Work Package containing a Feature is updated with additionally functionality	▪ Scope of the Feature is updated to reflect changes. ▪ If new scope budget can come from UB. ▪ If unplanned scope change, budget can come from MR.	▪ Exit criteria for the Feature is updated to reflect changes ▪ New Feature added to the Backlog.

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7 Forecast Update and Change Scenarios

1 Stories planned for a 3 sprint feature will not complete as planned.

2 Stories planned for 3 sprint feature are move to 4th sprint.

3 Planned feature will not complete by formal delivery date.

4 Story determined not to be necessary for feature.

5 Determined a user story needs to be added to a Feature.

6 After feature and stories accepted, problem found.

7 Feature assigned to release reprioritized to future release.

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❶ Stories Planned for a 3 Sprint Feature Will Not Complete As Planned

Scenario	PMB Action	Agile Action
▪ Feature planned for 3 Sprints has started work ▪ Team determines some Stories for the Feature will not be completed in their planned Sprint ▪ Stories are moved to the next Sprint ▪ Stories remain inside the Baseline Feature release date.	▪ No change in the PMB Work Package ▪ Stories can be moved inside the Feature ▪ Moving the Story has no impact on the PV	▪ Backlog is updated to move incomplete Stories from 1st Sprint to the 3rd Sprint ▪ Recording the assignment of the Story to a Feature, but has no impact on the Work Package containing the Feature ▪ Assigning the Story to the new Feature is done in the Agile management tool

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❷ Stories Planned for 3 Sprint Feature Are Move to 4th Sprint

Scenario	PMB Action	Agile Action
▪ Feature planned to be completed in 3 Sprints has started ▪ Some Stories will not complete as planned in 3rd Sprint. ▪ Those Stories moved to a 4th Sprint beyond the planned Finish of the 3 Sprints.	▪ No change to the Work Package containing the Feature or the PV of that Work Package ▪ Stories can be moved from Sprint to Sprint within Work Package containing the Features. ▪ PV for the Work Package is flat spread, so moving work has no impact on PV. ▪ EV claimed only when Stories complete, so this claim has no knowledge of specific Stories	▪ Backlog is updated to move the Stories not completed in the 1st Sprint is moved to the 3rd Sprint

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③ Planned Feature will not Complete by Formal Delivery Date

Scenario	PMB Action	Agile Action
• Feature has started but will not complete by planned delivery date. • Customer has stated the Feature is needed by the planned delivery date.	• No change to Feature Work Package in Baseline schedule • Feature is forecast to slip beyond the delivery date – at the end of the last Sprint. • The IMS shows the late date (forecast update). • The Critical Path for the Feature sequence is impacted with reduced float (if there was any) • Float, EAC are updated in the IMS.	• Unfinished Stories are moved to a Sprint in the next release cycle • In that cycle, they are forecast to completed. • Move the Story Points or Ideal Days with the Story to the release cycle.

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④ Determined a Story is not Necessary for Feature to be Completed

Scenario	PMB Action	Agile Action
• Story in a Feature has been determined to be unnecessary. • The Feature Work Package is open. • QBD's for the Feature include the unneeded Story.	• No change to Work Package containing the Feature • No change to the PMB • QBD for the Feature updated to remove the Story. • Adjust Physical Percent Complete for the Feature and the Work Package for the work no longer being performed – the unfinished work is decreased, raising the Physical Percent Complete. • Adjust the EAC and Forecast in the IMS.	• Remove the Story from the Backlog. • Remove the Story Points or Ideal Days from the Backlog

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⑤ Determined a User Story Needs to be Added to a Feature

Scenario	PMB Action	Agile Action
▪ Work Package for the Feature is open. ▪ New Story needed for a Feature produced by in open Work Package that came from an increased understanding of the Feature. ▪ Exit Criteria (QBD) of the Feature is unchanged with this new Story.	▪ No change to Work Package containing the Feature. ▪ The QBD for the Feature is updated with the addition of the Story	▪ The Story is added to the Sprint Backlog

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⑥ After Feature and Stories Accepted, Problem Found

Scenario	PMB Action	Agile Action
▪ Feature and Stories accepted and 100% of the Value recorded. ▪ Problem with delivered Feature is found. ▪ Defect must be corrected before release of Feature	▪ There is a Work Package for Defect Reports in the current Release, the DR is added to the Exit Criteria (QBD) for that Work Package. ▪ EV can be unclaimed in current reporting period for the Work Package when the planned worked now requires rework . ▪ Or, cost and schedule is used to deprecate EV with additional – unplanned – work inside the Work Package. Work Package overruns due to unplanned and unbudgeted work. [13]	▪ The DR Story is added to the Backlog and mapped to a DR Work Package – if there is a separate Work Package ▪ The DR Story is added to the Backlog and mapped to a Feature Work Package, if there is no DR Work Package

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7 Feature Assigned to Release Reprioritized to Future Release

Scenario	PMB Action	Agile Action
▪ Features assigned to one future Release are reprioritized to another future Release. ▪ Budget for the future Feature Release is held in a Planning Package.	▪ Budget moved with reprioritized Feature and its move to a future Release. ▪ No change in BAC or schedule, because work is not detail planned.	▪ Backlog updated. ▪ Feature mapped to new Release. ▪ Road Map updated with new Feature.

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Walk Through of Two Scenarios for the Notional UAS

- Defer a Feature (Autonomous Takeoff) from Release 1 to Release 2

- Replace the 1 Feature with a new Feature (Pilot Controlled Takeoff in place of Autonomous) to Release 1

5 Baseline Change Scenarios

① Feature in PMB not opened and moved to new work package.

② Open feature incomplete at end of planned Sprint.

③ **Feature in current release moved to another release.**

④ Planned initiative and resulting feature removed from baseline.

⑤ Feature completion criteria updated with additional functionality.

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Student Scenarios for the Notional UAS

■ Defer a Feature (Autonomous Takeoff) from Release 1 to Release 2

■ Replace the 1 Feature with a new Feature (Pilot Controlled Takeoff in place of Autonomous) to Release 1

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7 Forecast Update and Change Scenarios – Student Exercise

1. Stories planned for a 3 sprint feature will not complete as planned.
2. Stories planned for 3 sprint feature are move to 4th sprint.
3. **Planned feature will not complete by formal delivery date.**
4. Story determined not to be necessary for feature.
5. Determined a user story needs to be added to a Feature.
6. **After feature and stories accepted, problem found.**
7. Feature assigned to release reprioritized to future release.

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Questions?
Comments?
Ideas?
Concerns?

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