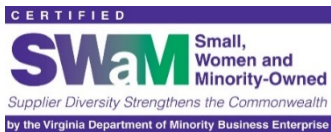


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EVM Metrics in Federal Government Agile Contracts: Filling the Project Monitoring Gap in Agile Projects

Presented by

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May 8, 2019

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Agenda

- ❖ Background and Objectives
- ❖ Earned Value Management
- ❖ Agile Scrum for Application Development
- ❖ Agile on EVM
- ❖ Why Agile projects fail?
- ❖ Using EVM KPIs to improve Agile performance
- ❖ Q & A



Background & Objectives

❖ Background:

- In recent years, Governments have been adopting Agile practices for software development projects, which provide a lean flow of value
- EVM, as a method of project control, has been successfully practiced in traditional engineering projects and for software products
- OMB Circular A-11, Page 843: The acquisition strategy should make sure any contracts resulting from the acquisition that meet the Major Acquisition Threshold contain requirements for the use of EVM.
- OMB Circular A-11, Page 850: If the scope of work requires development type work, EVM must be the major management system used.
- ANSI 748 standard recommends the use of EVM as a good project management practice when applicable for development efforts or multiple projects in a program

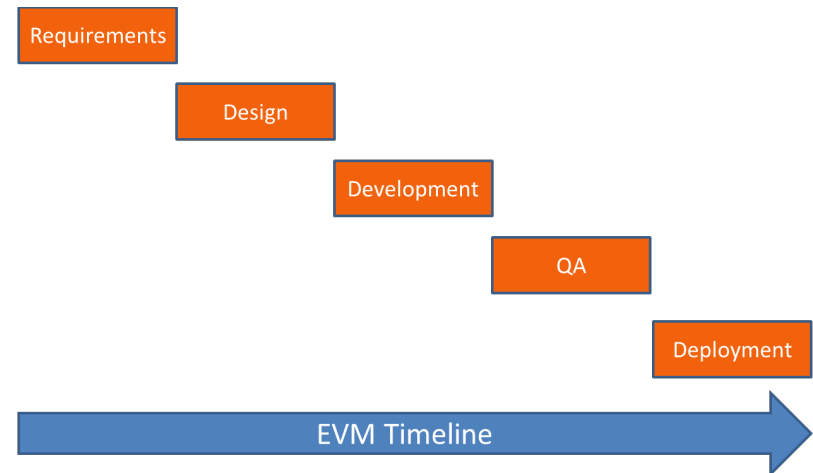
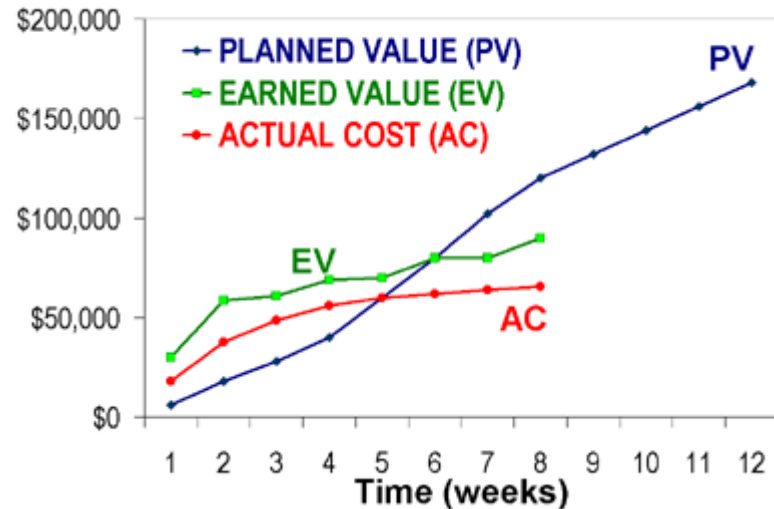
❖ Objective

- In this presentation authors discuss the implementation of EVM in Agile projects, and review how to use EVM metrics to monitor and improve performance in Agile projects. Real life scenarios focus on how Contract Officers and Project Managers can use EVM metrics to identify early signs of potential performance problems in projects.

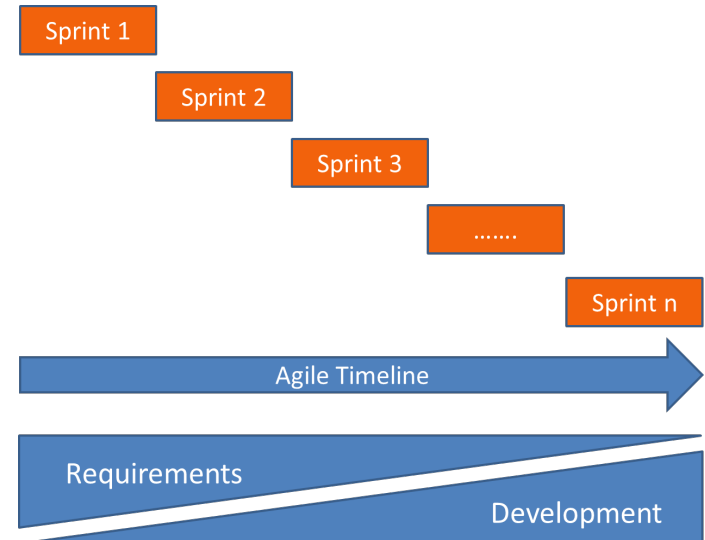
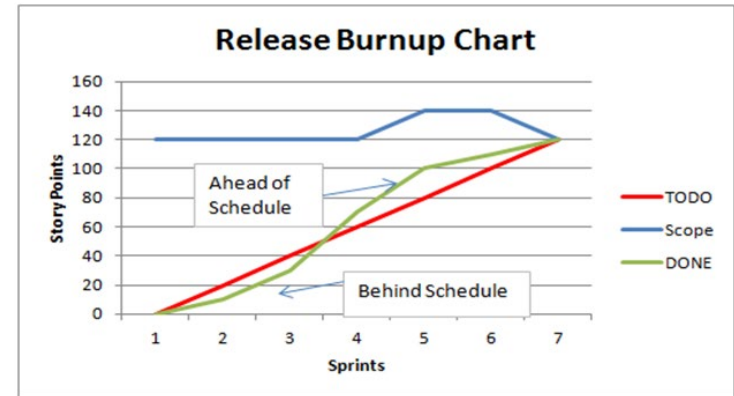


Earned Value Management (EVM)

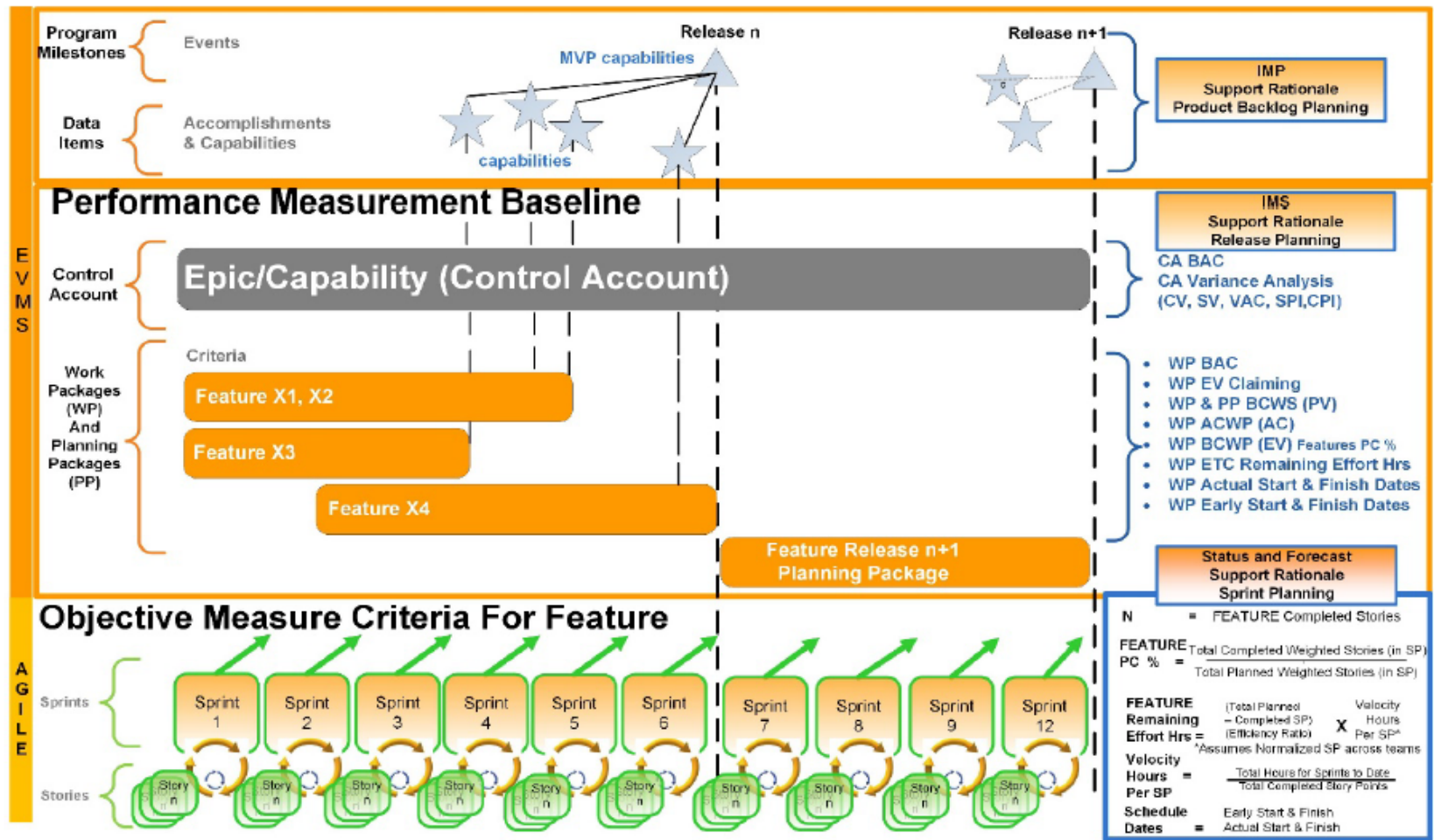
- ❖ A project management technique for measuring project performance and progress.
- ❖ EVM has the ability to combine measurements of the project management triple constraint: scope, time, and costs.
- ❖ Application of EVM principles provides positive predictors of project success. Provides accurate forecasts of project performance problems.
- ❖ EVM for Software Development typically used in waterfall model (relatively linear sequential design and development approach).



Agile Scrum Framework



Agile on EVM



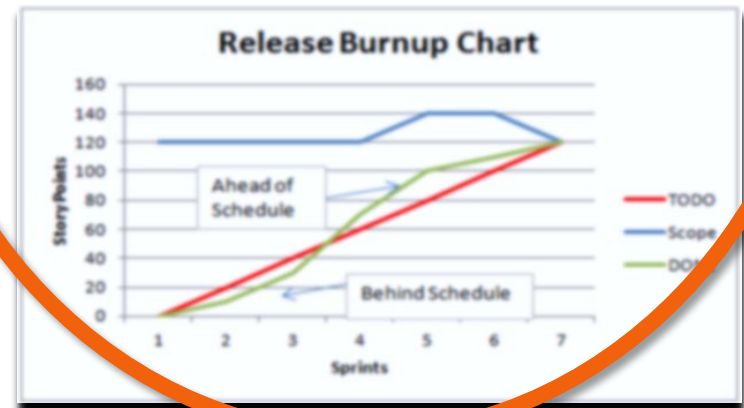
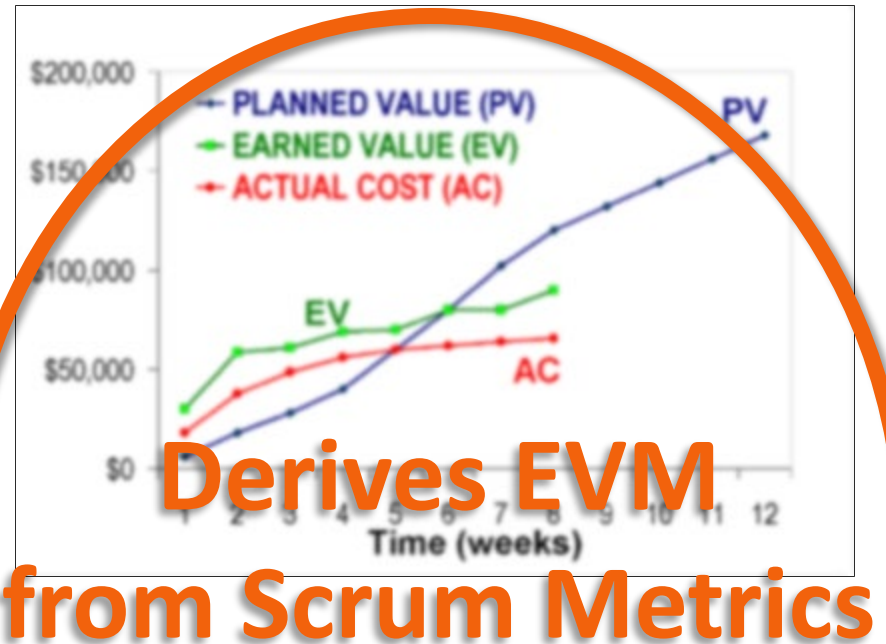
NDIA's Agile Product and Time Hierarchies

https://www.humphreys-assoc.com/evms/evms-documents/ndia/NDIA_IPMD_EVM_Agile_Guide_Rev_Mar112016.pdf



Agile Scrum EVM framework

- ❖ It is an adapted implementation of EVM that uses Agile Scrum framework inputs to calculate traditional EVM metrics.
- ❖ Agile Scrum EVM framework is based on the notion that total scope is known. The framework is not well-suited for large-scale agile programs.
- ❖ Requires a minimal set of input parameters:
 - Planned and actual cost of a project
 - Estimated product backlog
 - Release plan (Product roadmap and number of iterations)
 - Assumed velocity (story points as a measure of story complexity and velocity)
- ❖ Agile Scrum EVM combines burn-up charts (as used in Scrum) with project cost information.



Agile Metrics to Track EVM KPIs

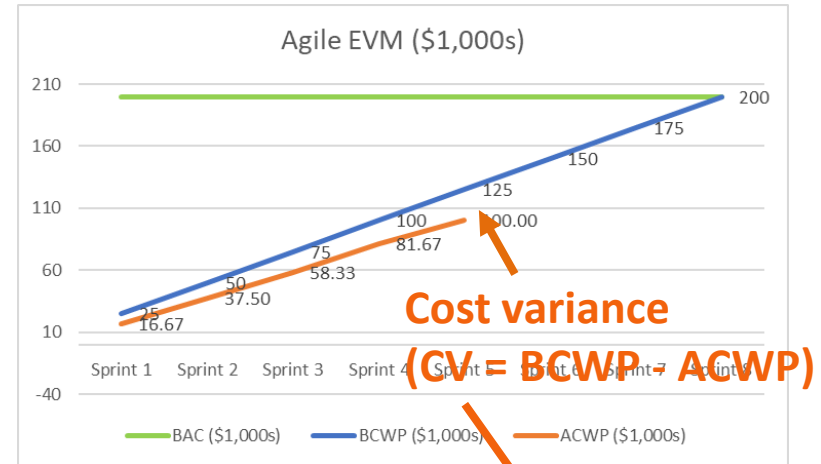
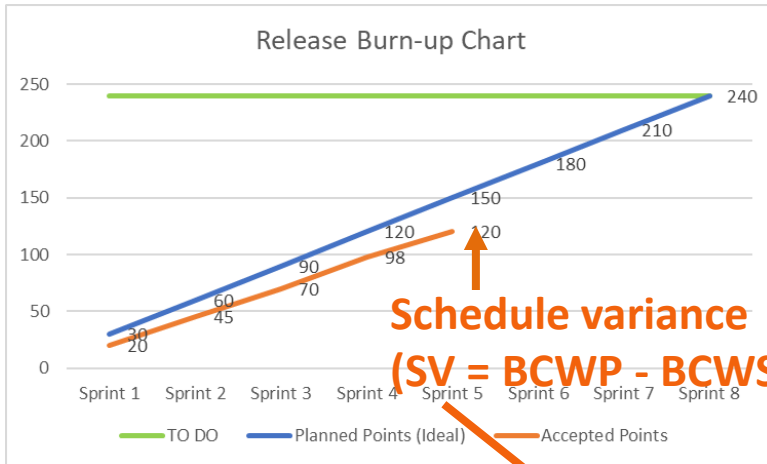
❖ Agile EVM – Glossary & KPIs

- **Actual Cost (AC) a.k.a., Actual Cost of Work Performed (ACWP)** – The AC represents the total costs incurred in accomplishing the work completed (usually cumulative to date, or any selected time period).
- **Budget at Completion (BAC)** – The total value of budget (distributed) within the Performance Measurement Baseline (PMB).
- **Earned Value (EV) a.k.a., Budgeted Cost of Work Performed (BCWP)** – The EV is the cumulative value of the work performed (usually cumulative to date, or any selected time period). EV is calculated at feature level, project level and program level in dollars and story points.
- **Planned Value (PV) a.k.a., Budgeted Cost of Work Scheduled (BCWS)** – The sum of the authorized budgets for work planned to be completed plus the level of effort scheduled to be accomplished (usually cumulative to date, or any selected time period). EV is calculated at feature level, project level and program level in dollars and story points.
- **Cost Performance Index (CPI)** – The CPI is the performance ratio comparing BCWP (EV) and ACWP (AC), for any given period of time. (EV/AC) . CPI gives a measure of efficiency. A CPI of 1 indicates the project is spending the at the planned rate of expenditures. A CPI less than 1 means the project is over budget. A CPI greater than 1 means project is under budget.
- **Cost Variance (CV)** – The difference between EV and AC for any given period of time. $(BCWP-ACWP)$
- **Estimated Cost at Completion (EAC)** – Statistical estimate of all costs at complete based upon current performance, calculated by taking actual direct costs allocated to the contract plus a forecast for costs of authorized work remaining based on cumulative performance to date.
- **Schedule Performance Index (SPI)** – The schedule performance index is the performance ratio comparing EV and PV for any given time period. $(BCWP/BCWS)$. A CPI of 1 indicates the project is spending the at the planned rate of expenditures. An SPI less than 1 means the project is behind schedule. An SPI greater than 1 means project is ahead of schedule.



Agile EVM Metrics

(FFP capacity model)



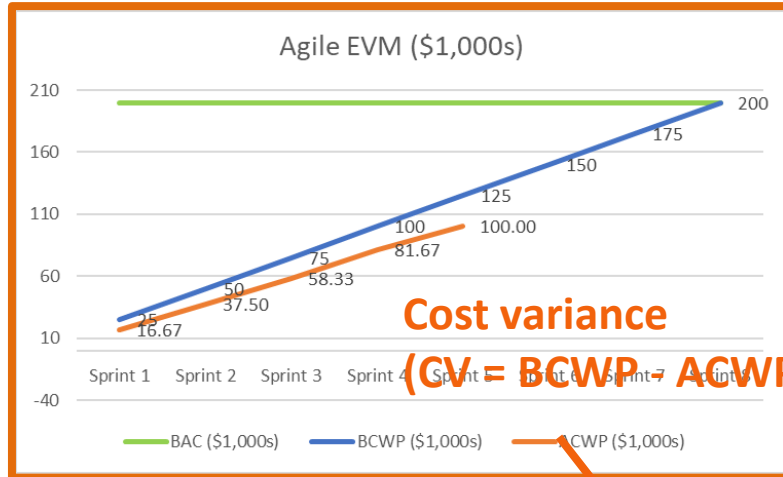
Sprint	Planned Velocity per Sprint	Accepted Points per Sprint	Project Budget per Sprint (FFP - \$1,000s)	Actual Spent per Sprint (FFP - \$1,000s)	Planned Points (BCWP in Points)	Accepted Points (BCWS in Points)	Schedule Variance in Points (SV = BCWP - BCWS)	Planned Value in Dollars (PV or BCWS in \$1,000s)	Earned Value in Dollars (EV or BCWP in \$1,000s)	Actual Cost in Dollars (AC or ACWP in \$1,000s)	Cost Variance in Dollars (CV = EV - AC)
Sprint 1	30	20	\$ 25.00	\$ 25.00	30	20	-10	\$ 25.00	\$ 16.67	\$ 25.00	\$ (8.33)
Sprint 2	30	25	\$ 25.00	\$ 25.00	60	45	-15	\$ 50.00	\$ 37.50	\$ 50.00	\$ (12.50)
Sprint 3	30	25	\$ 25.00	\$ 25.00	90	70	-20	\$ 75.00	\$ 58.33	\$ 75.00	\$ (16.67)
Sprint 4	30	28	\$ 25.00	\$ 25.00	120	98	-22	\$ 100.00	\$ 81.67	\$ 100.00	\$ (18.33)
Sprint 5	30	22	\$ 25.00	\$ 25.00	150	120	-30	\$ 125.00	\$ 100.00	\$ 125.00	\$ (25.00)
Sprint 6	30		\$ 25.00		180			\$ 150.00			
Sprint 7	30		\$ 25.00		210			\$ 175.00			
Sprint 8	30		\$ 25.00		240			\$ 200.00			
	240	120	\$ 200.00	\$ 125.00							



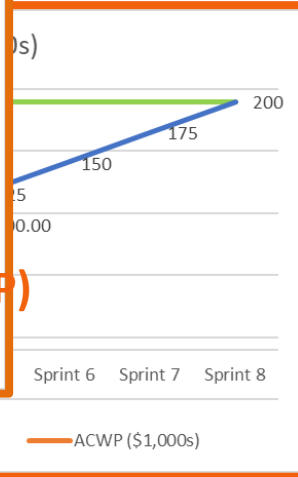
Agile EVM Roll-up – Portfolio Metrics

(FFP capacity model)

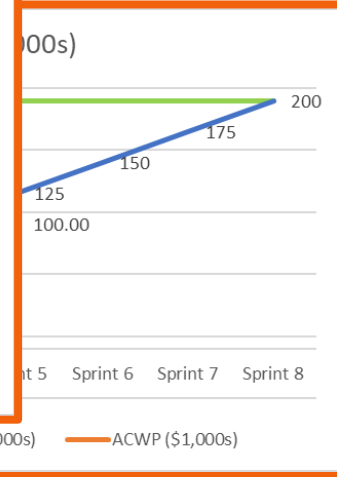
Application 1



Application 2



Application 3



Application / Project	Total Budget (BAC)	Planned Value to Date (PV)	Earned Value to Date (EV)	Actual Cost to Date (AC)	Cost Variance (CV)	Cost Performance Index (CPI = EV/AC)	Schedule Performance Index (SPI = EV / PV)	Estimate at Completion (EAC = BAC / CPI)
Application 1	\$ 200.00	\$ 175.00	\$ 100.00	\$ 125.00	\$ (25.00)	0.80	0.80	\$ 250.00
Application 2	\$ 300.00	\$ 150.00	\$ 150.00	\$ 150.00	\$ 0.00	1.00	1.00	\$ 300.00
Application 3	\$ 800.00	\$ 175.00	\$ 200.00	\$ 180.00	\$ 20.00	1.11	1.14	\$ 720.00
Program Totals	\$ 1,300.00	\$ 450.00	\$ 450.00	\$ 455.00	\$ (5.00)	0.99	1.00	\$ 1,314.44

Portfolio EAC = BAC / CPI (\$1,314 = \$1,300 / 0.99)



Why Agile projects fail?

- ❖ Based on a literature review, there are about 50 reasons listed on why agile projects fail, and they can be categorized as:
 - Lack of experience/training with the methodology
 - Culture
 - Organization's values not aligned with Agile core values
 - Not open to change
 - Other non-agile teams of the organization not being open about agile
 - Lack of buy-in from executive level

Source:

- Agile problems, challenges, & failures , Miller, <https://www.pmi.org/learning/library/agile-problems-challenges-failures-5869>
- 8 Reasons Why Agile Projects Fail, Cunningham, <https://www.agilealliance.org/8-reasons-why-agile-projects-fail/>
- Agile Failure Patterns in Organizations 2.0, <https://age-of-product.com/agile-failure-patterns-in-organizations/>
- The impact of Organizational Culture on Agile Method Use, Strosede, Huff & Tretiakov, https://www.researchgate.net/publication/221183602_The_Impact_of_Organizational_Culture_on_Agile_Method_Use



Impact of Organizational Culture in Agile Method Use

Organizational Culture Factors that correlate significantly with Agile methods performance. The organization:

- ❖ Values feedback and learning. Social interaction is trustful, collaborative and competent. The project manager acts as a facilitator.
- ❖ Values teamwork, is flexible and participative.
- ❖ Enables empowerment of people.
- ❖ Is results oriented.
- ❖ Leadership is entrepreneurial, innovative and risk taking.
- ❖ Is based on loyalty and mutual trust and commitment.

- The impact of Organizational Culture on Agile Method Use, Strosede, Huff & Tretiakov, https://www.researchgate.net/publication/221183602_The_Impact_of_Organizational_Culture_on_Agile_Method_Use

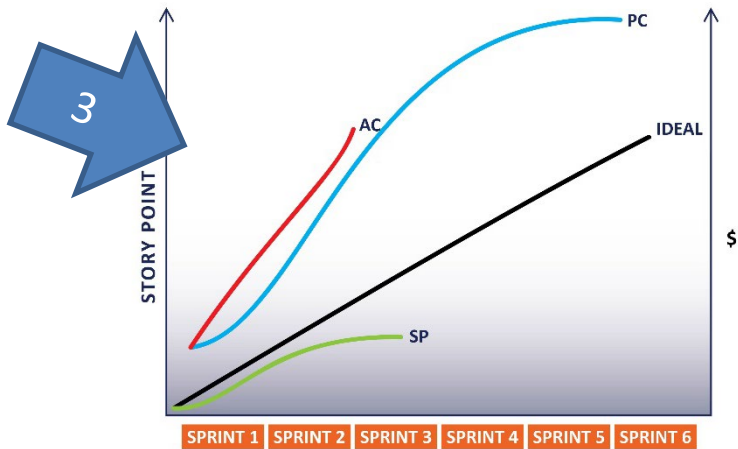
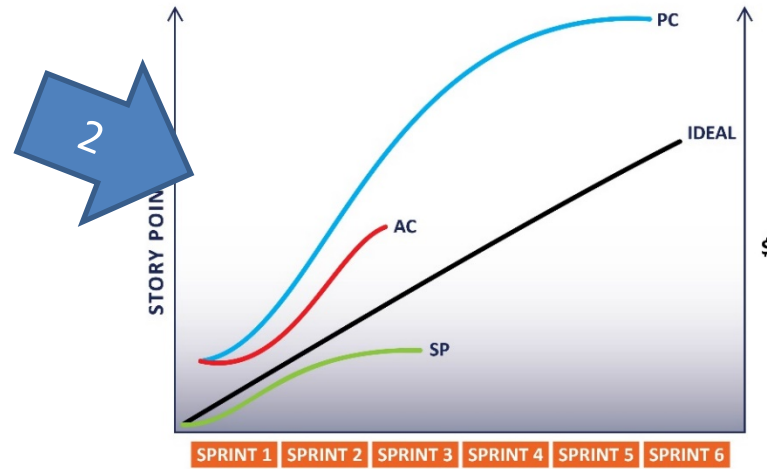
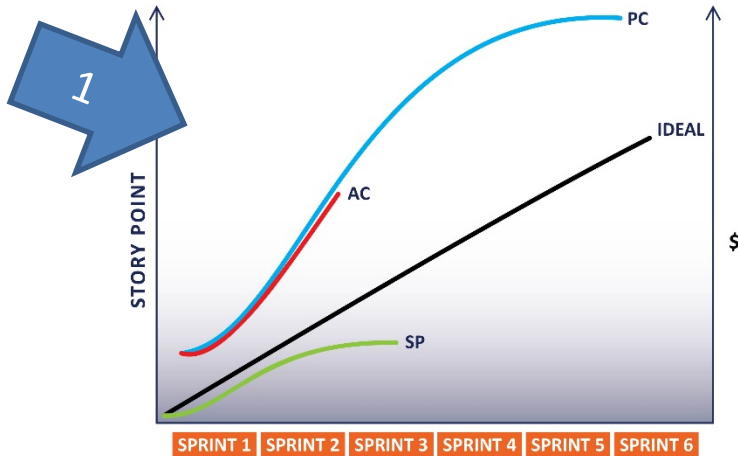


EVM Baseline Maintenance in Agile environments

- ❖ Requires active engagement of the government.
- ❖ Requires frequent backlog grooming sessions to decide how to deal with changes in scope (this is the nature of agile). For Example:
 - Taking features out of releases using controlled change process
 - Removing stories if they are not necessary for the release baseline, causing a positive schedule variance
 - Adding unplanned stories needed to accomplish the desired feature, causing a negative schedule variance
 - Adding features that were not in the original contract, causing a contractual direction and modification
 - Improving team velocity, allowing the team to complete additional work from the backlog. This could require a baseline change and/or cause positive schedule variance



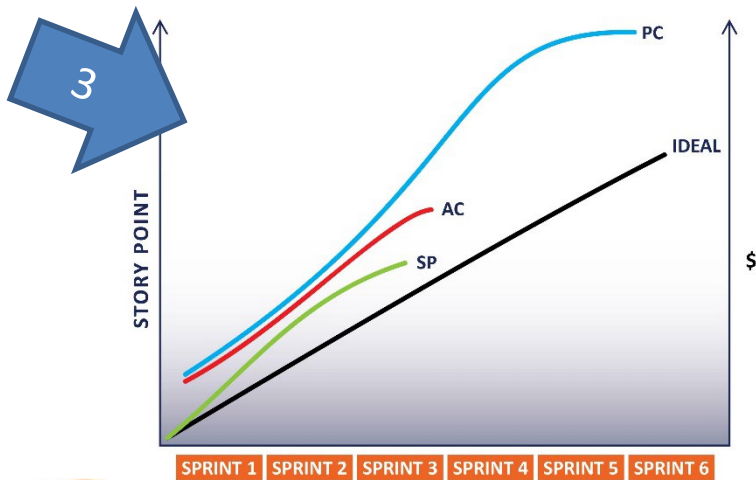
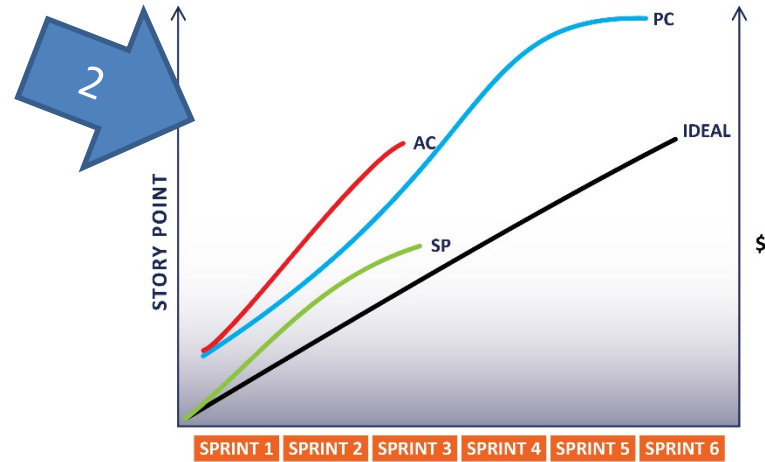
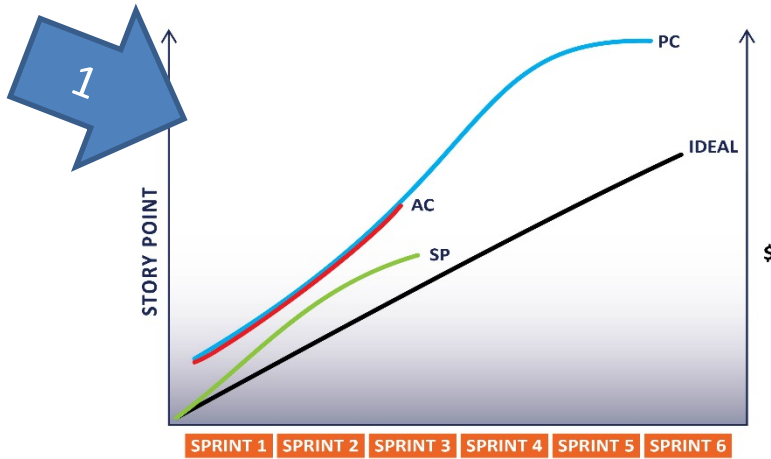
Negative Burnup Variance



#	Most Possible Scenario	Who should get engaged?
1	Under performing scrum team	PM/Scrum Master
2	Wrong estimation of velocity	PM/Scrum Master
3	Wrong estimation on story points	Scrum Master/Tech Lead/PO



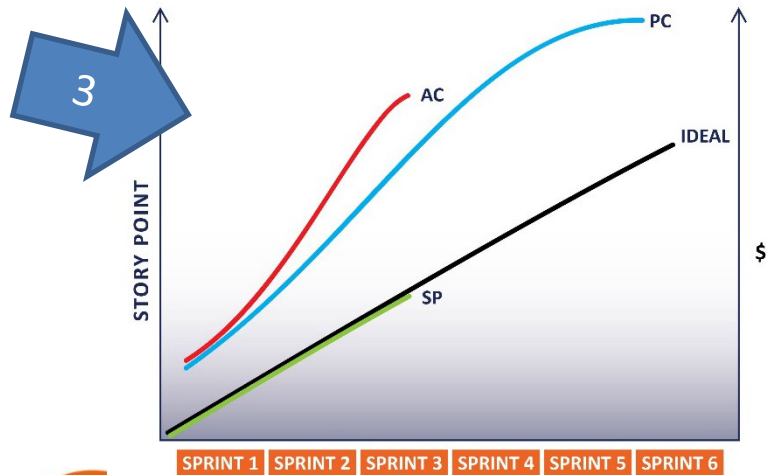
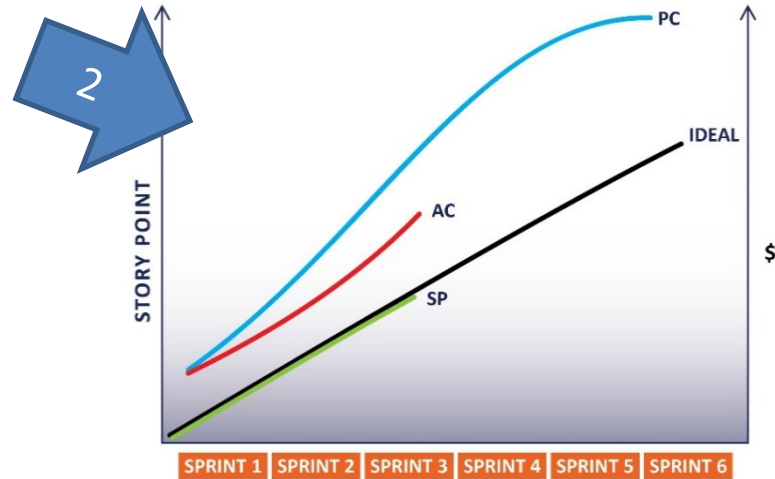
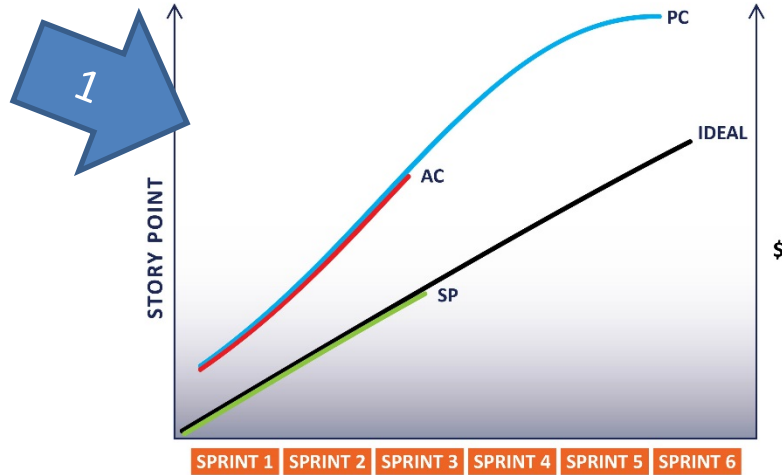
Positive Burnup Variance



#	Most Possible Scenario	Who should get engaged?
1	Velocity improvement	Scrum Master
2	Wrong estimation of velocity	PM/PO
3.1	Velocity improvement	Scrum Master Technical Lead/PO
3.2	Wrong story point estimation	



Burnup on Track



#	Most Possible Scenario	Who should get engaged?
1	Mature Scrum Team	Scrum Master/PO
2	Over Performing scrum team (improved velocity)	Scrum Master/PO/PM
3.1	Wrong estimation on story points	Technical Lead/PO PM/Scrum Master
3.2	Under performing scrum team	







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