Integrating Agile with Project Controls

PGCS: Project and Program Management Symposium

August 16, 2022

Keynote

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Presenter Experience

- Gordon Kranz – President, Enlightened Integrated Program Management, LLC. Providing PM and Engineering expertise and training to Industry and government
  - 11 years as AF officer as PM and SE on DoD acquisition programs
  - 16 years as Systems and Chief Engineer and Program Manager on embedded avionics and ground system mission computing systems
  - 7 years as Office of Secretary of Defense Senior Executive responsible for SE, Contracts, and EVM policy and implementation
  - 7 years providing support to DoD on Agile and EVM policy, implementation, and training.

Experienced but still learning every day

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Why Agile? –

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- Technology Enabled Market
- Commercial Need
  - Competitiveness (First to Market, Adapt to User desires, real time sustainability)
  - Applications
    - Cell Phone, Video Streaming, Business collaboration, Enterprise business systems
- Government Need
  - Stay ahead of the other guy (Real time threat adaptation)
  - SW Applications
    - SW Intel, Enterprise, Command and Control, …
    - Integrated Hardware and Software Systems

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What does it mean to be Agile?

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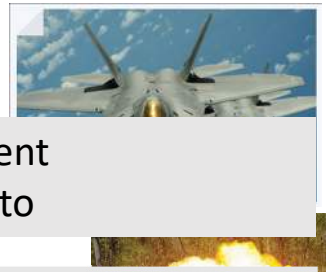
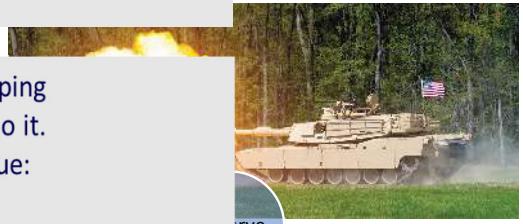




SW Development
Agile Manifesto

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

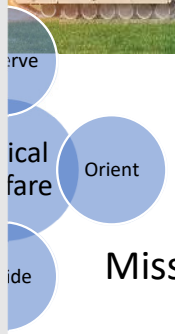
Individuals and interactions **over** processes and tools

Working software **over** comprehensive documentation

Customer collaboration **over** contract negotiation

Responding to change **over** following a plan

That is, while there is value in the items on the right, we value the items on the left more.



Mission Agility

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Principles behind the Agile Manifesto

(We Follow These Principles)

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

2. Welcome changing requirements, even late in development. **Agile processes harness ch**ange for the customer's competitive **advantage**.

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

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

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

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

7. **Working software is the primary measure of progress**.

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

9. 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.

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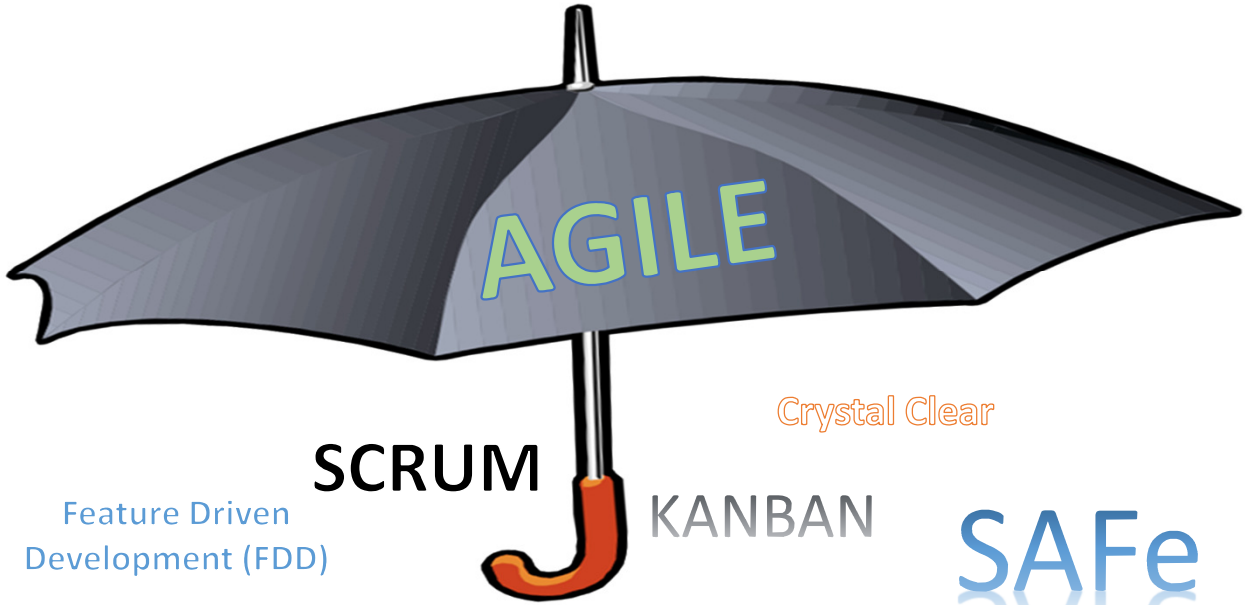
Agile is not a single method



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Benefits

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- Customer Focused
- Disciplined
- Objective
- Transparent
- Flexible
- Adaptive
- Delivery Focused

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Time, Cost, and Scope

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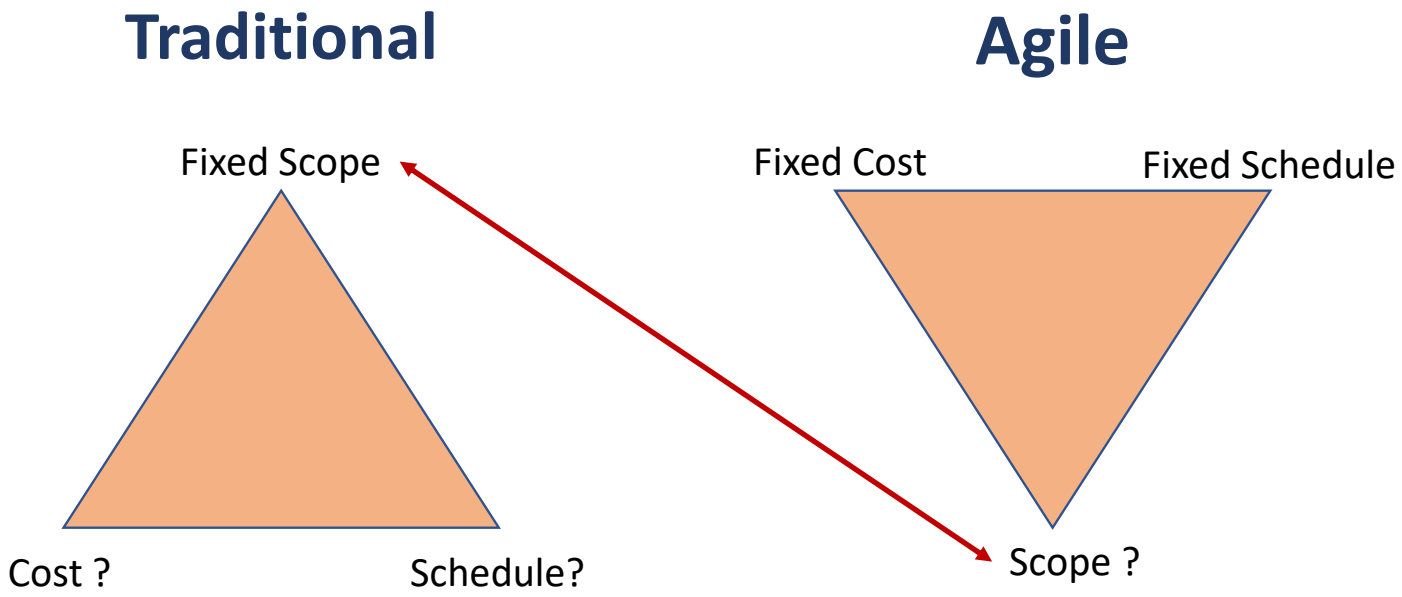

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Agile SW Development Defined

https://en.wikipedia.org/wiki/Agile_software_development

- Agile software development is a group of software development methods in which **solutions evolve through collaboration** between self-organizing, cross-functional teams.*
- Agile promotes adaptive planning, evolutionary development, **early delivery, continuous improvement**, and encourages rapid and flexible response to change. *
- Agile is an empirical process.

FACT or MYTH: Agile Development Methods Do Not Need User Defined Requirements

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Three pillars of empirical process control

www.scrum.org

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- Transparency
  - Significant aspects of the change **process must be visible to those responsible** for the outcome. Transparency requires those aspects be defined by a **common standard**, so observers share a common understanding of what is being seen.
- Inspection
  - Evidence-Based change participants must **frequently inspect artifacts and progress toward a goal**. They should be able to detect undesirable variances. Their inspection should not be so frequent that inspection gets in the way of the work. Inspections are most beneficial when diligently performed.
- Adaptation
  - If one or more aspects of a change deviate outside acceptable limits so that the resulting improvement will be unacceptable, an adjustment must be made as soon as possible to minimize further deviation.

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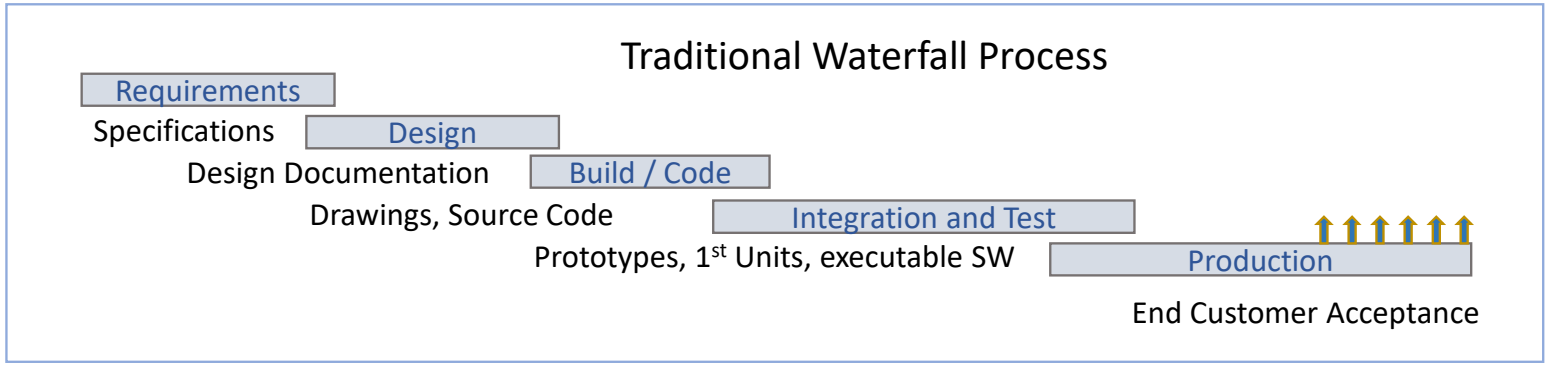
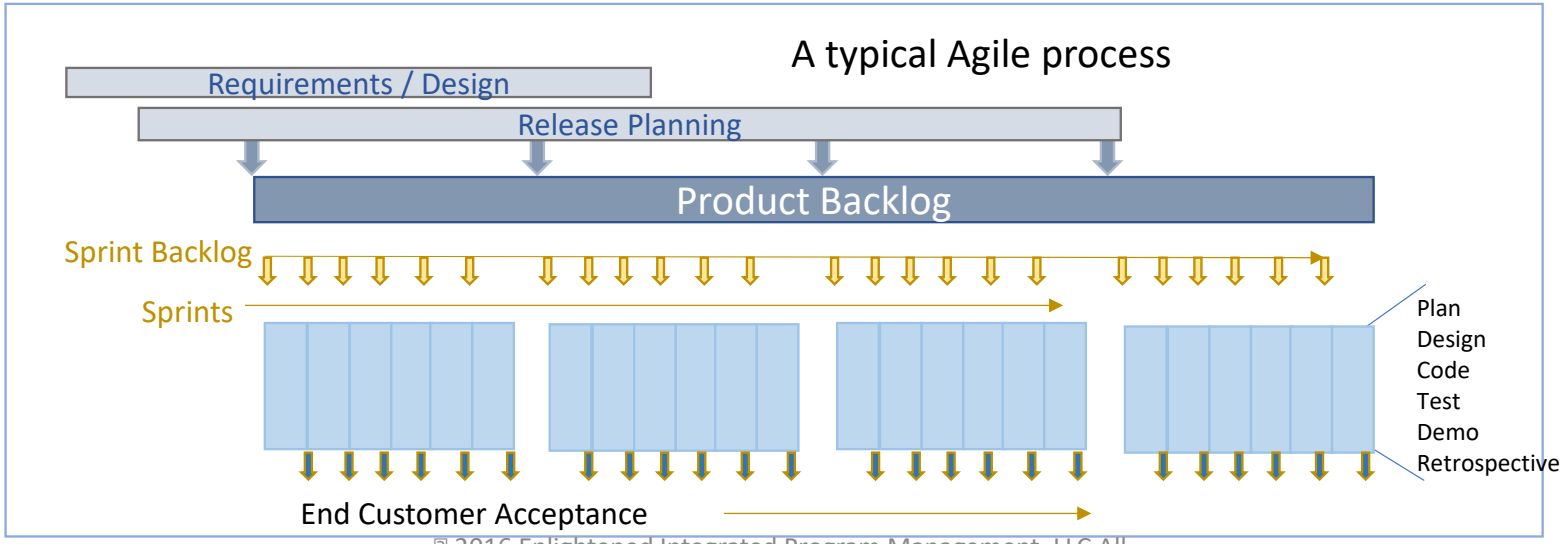
Traditional vs Typical Agile Process





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Key Product Terms

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- Sprint
  - Two-week time-box for accomplishing work
  - A Team accepts work at the beginning of the sprint
  - Perform the work and evaluate progress at the end of the sprint
  - Evaluate sprint process and adjust as necessary
- Program Increment
  - Typically, a three-month time-box for accomplishing work.
  - Team(s) accept and plan work at the beginning of the increment based on priorities and objectives set by the overall program

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Agile Development Reviews / Planning "Ceremonies"

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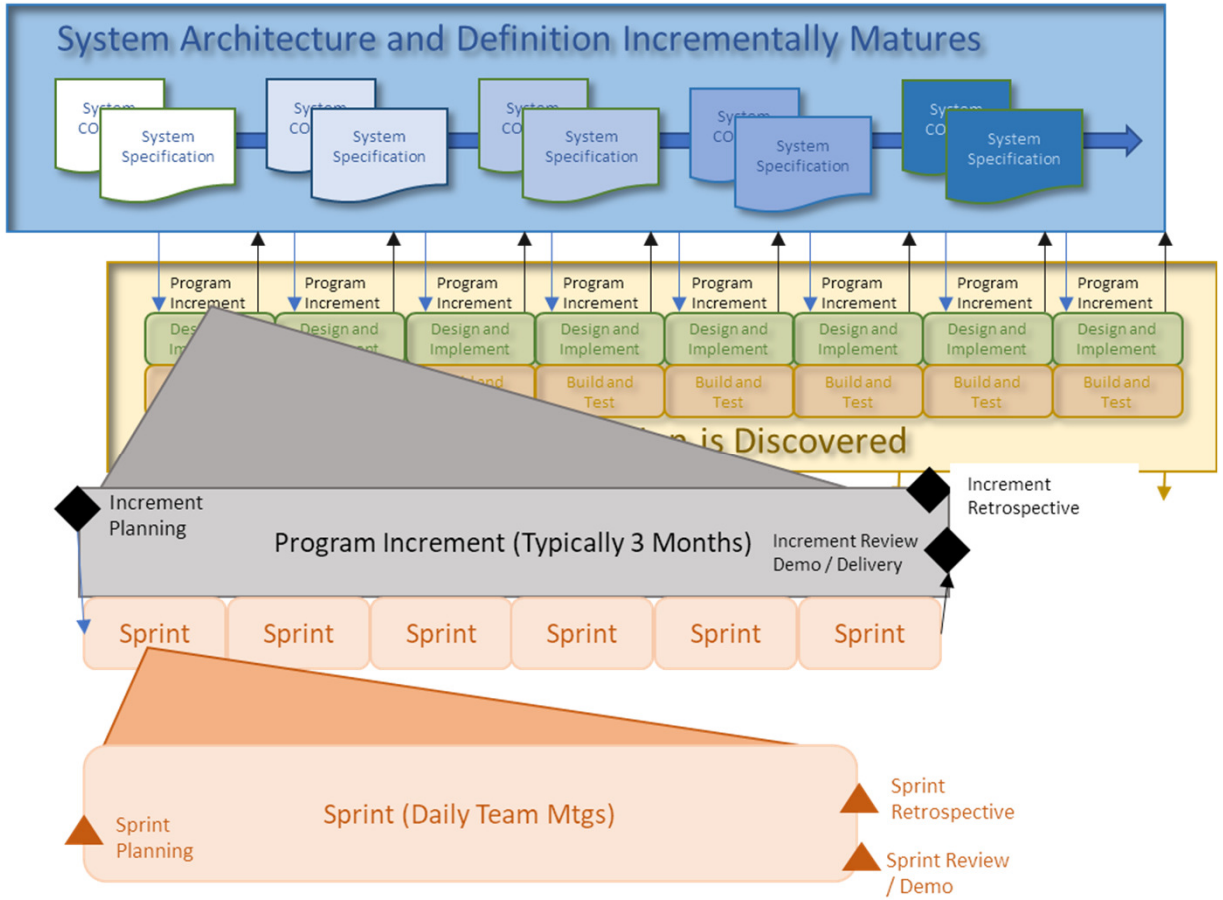
Rolling Wave Planning done by Program Increment (Quarterly)

Performance Management done Daily (Team Meetings), bi-weekly Sprint Reviews, quarterly (Program Increment Reviews)



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Perceived Barriers to implementation of Agile

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- Contracting
  - Risk of constructive changes being made due to daily customer engagement.
- Systems Engineering
  - Perception that systems engineering takes too long and is not needed.
  - Perception that SE does not allow for incremental discovery of system implementation.
- Program Management
  - Perception that the customer has no insight or control of the implementation.
  - Perception that Agile methods create a bow wave of work that cannot be overcome. Doing easy work first feigning progress.
- Earned Value Management (Project Controls)
  - Perception that the planning, budgeting, baselining, and revision process is too cumbersome to model Agile development.

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Barriers to implementation of Agile - Rebuttal

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- Contracting
  - Contracting methods exist that allow for user interaction
  - Boundaries must be set.
- Systems Engineering
  - Agile still requires a strategic system roadmap to guide the system development.
  - SE involvement is critical to set the priorities and adapt the implementation concept as the system matures.
- Program Management
  - True agile methods demand transparency and end user engagement.
  - Agile prioritizes implementation based on user need, and not on what is easy.
- Earned Value Management
  - Office of the Secretary of Defense studies have shown that EVM can be used to model Agile development with the benefit of offering a strategic forecast view of the program.

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Agile Metrics

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- Velocity
  - A measure of a sprint teams' efficiency
- Product Burn Down
  - Typically focused on Program Increments which are Agile Timeboxes
- Release Burn Up
  - Typically refers to a specific work scope that needs to be delivered independent of the number of sprints or increments

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Velocity Examples

Team is establishing a predictable capacity
- Can inform forecasting remaining work.

Team is not yet established predictable capacity
- Likely identifies risk that needs to be addressed.

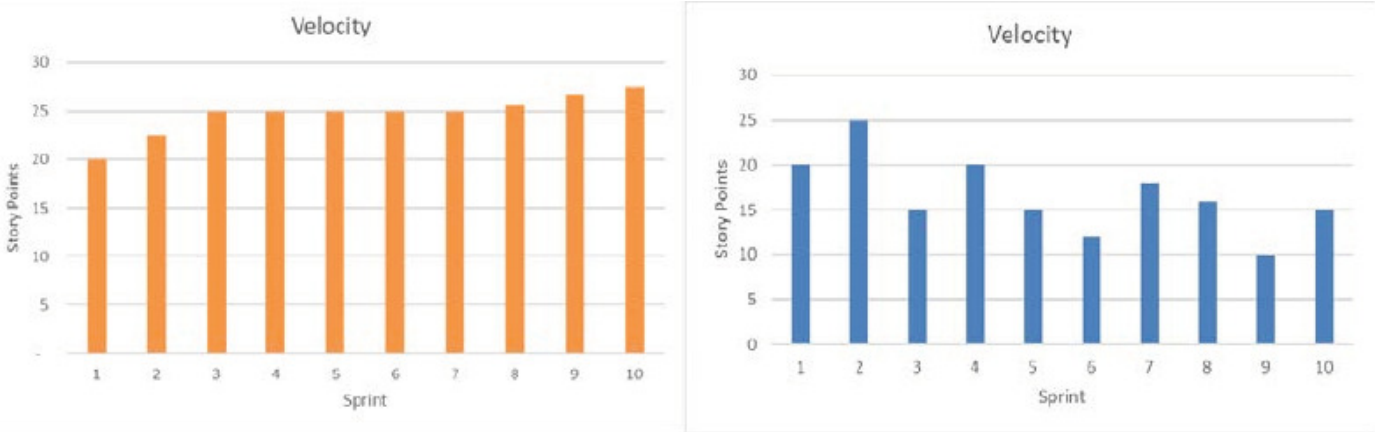

FIGURE 10. Velocity Diagram for Two Different Teams

Velocity is a Sprint Team Efficiency Metric

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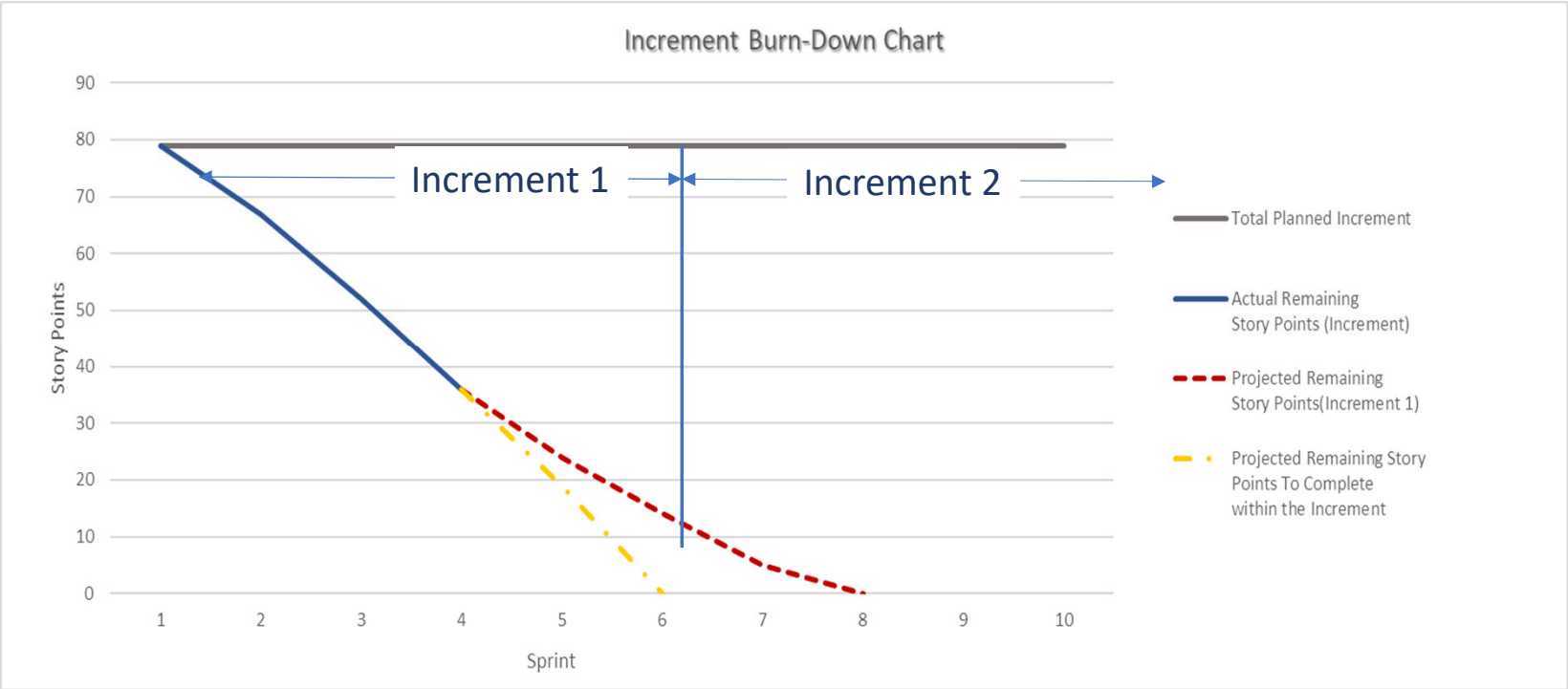
Product Burn Down



A measure of the remaining work within an increment.
Indicator of work that will be pushed into next increment

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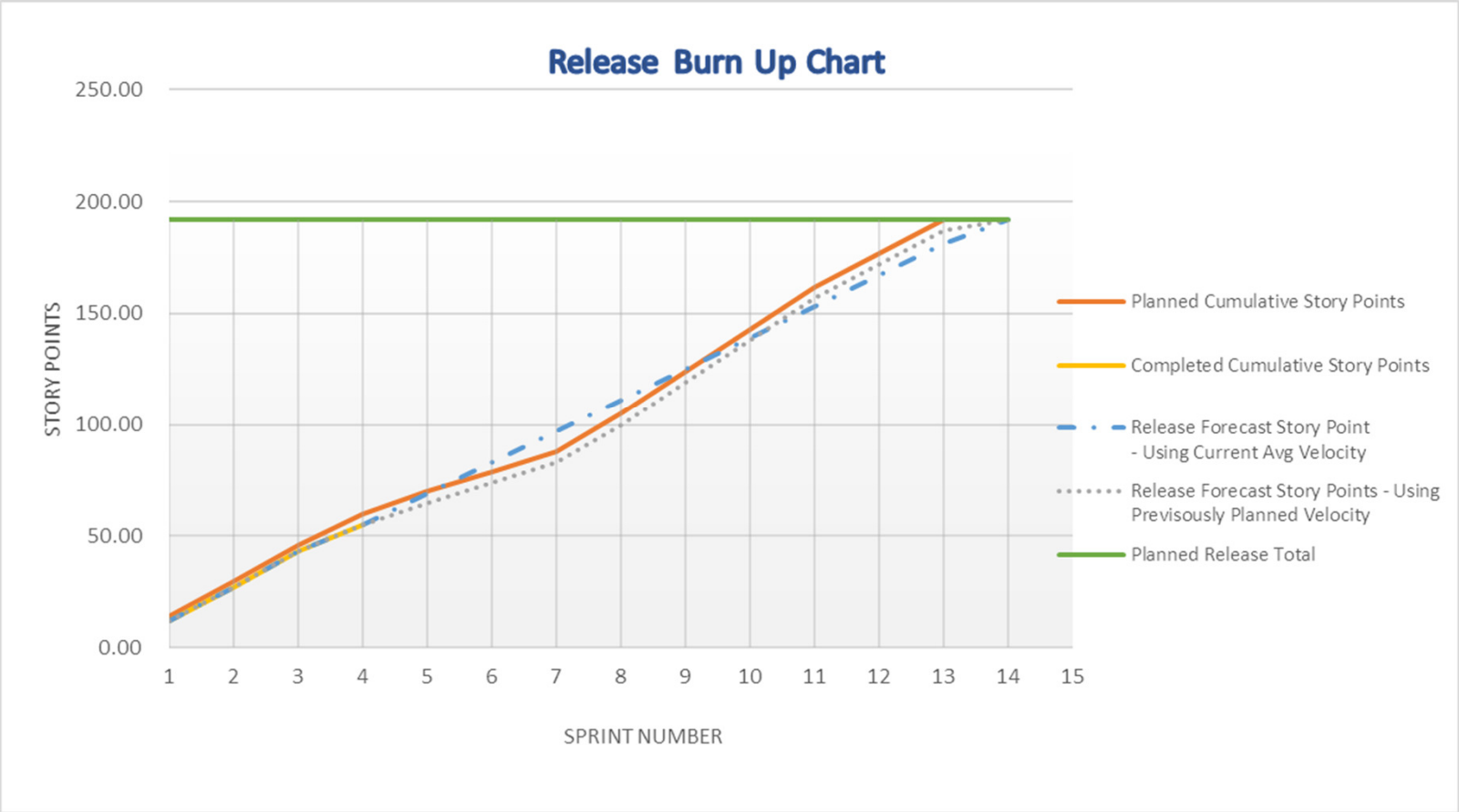
Release Burn Up



Tracked using Total Estimated Story Points

Must look deeper for actual capability been delivered

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Pulling the Thread

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Agile Product Roadmap Simplified Example

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Notional Roadmap for Agile

Schedule Items	Qtr 1			Qtr 2			Qtr 3			Qtr 4			Qtr 1			
	Mth 1	Mth 2	Mth 3	Mth 4	Mth 5	Mth 6	Mth 7	Mth 8	Mth 9	Mth 10	Mth 11	Mth 12	Mth 13	Mth 14	Mth 15	Mth 16
Contract Award	◆				RE1				RE2					RE3		
Release Events					◆				◆					◆		
Increments				◆			◆			◆			◆			
Business Objective																
Capability A																
Feature A1																
Feature A2																
Feature A3																
Feature A4																
Feature A5																
Feature A6																
Feature A7																
Capability B																
Capability C																

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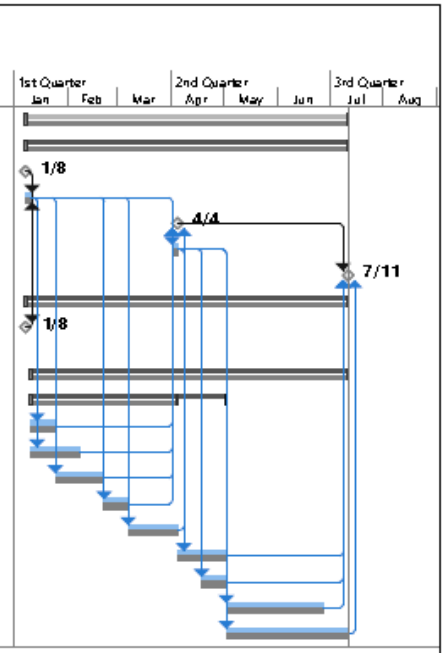
Tracking Status into IMS

WBS	EVM Level	Product Item	Roadmap Event (Release #)	Planned Sprint Number	Actual Sprint Number	Planned Value (Planned Story Points)	Completed Value (Completed Story Points)	% Complete	BCWS ($)
1.1	WBS	Prime Mission Subsystem							
1.1.1	WBS	Prime Mission Hardware							
1.1.2	WBS	Prime Mission Software				192	55	29%	$ 26,176.80
1.1.2.1	**CA**	**Capability A**				**105**	**55**	**52%**	**$ 16,220.00**
1.1.2.1.1	**WP**	**Feature A1**	**A**			**9**	**9**	**100%**	**$ 2,000.00**
		Story A1.1	A	1	1	2	2	100%	
		Story A1.2	A	1	1	5	5	100%	
		Story A1.3	A	1	2	2	2	100%	
1.1.2.1.2	**WP**	**Feature A2**	**A**			**19**	**19**	**100%**	**$ 2,500.80**
		Story A2.1	A	2	2	3	3	100%	
		Story A2.2	A	1	1	5	5	100%	
		Story A2.3	A	2	2	8	8	100%	
		Story A2.4	A	2	3	3	3	100%	
1.1.2.1.3	**WP**	**Feature A3**	**A**			**18**	**18**	**100%**	**$ 2,800.00**
		Story A3.1	A	2	2	2	2	100%	
		Story A3.2	A	3	3	8	8	100%	
		Story A3.3	A	3	4	3	3	100%	
		Story A3.4	A	3	3	5	5	100%	
1.1.2.1.4	**WP**	**Feature A4**	**A**	**4**		**14**	**9**	**64%**	**$ 2,800.00**
		Story A4.1	A	4		2	2	100%	
		Story A4.2	A	4	4	3	3	100%	
		Story A4.3	A	4	4	1	1	100%	
		Story A4.4	A	4	4	5		0%	
		Story A4.5	A	4	4	3	3	100%	
1.1.2.1.5	**WP**	**Feature A5**	**A**	**5,6**		**19**		**0%**	**$ 2,500.80**
1.1.2.1.6	**WP**	**Feature A6**	**A**	**6,7**		**17**		**0%**	**$ 1,920.00**
1.1.2.1.7	**WP**	**Feature A7**	**A**	**7**		**9**		**0%**	**$ 1,698.40**
1.1.2.2	**CA**	**Capability B**	**A**			**40**		**0%**	**$ 4,768.00**
1.1.2.3	**CA**	**Capability C**	**A**			**47**		**0%**	**$ 5,188.80**
Total						**192**			

Stories completed during “Sprints” (Iterations) Contribute to Feature Completion –> Rolled into Schedule

					Duration	Start
				line	133 days	Mon 1/8/18
					133 days	Mon 1/8/18
					0 days	Mon 1/8/18
					3 days	Mon 1/8/18
					0 days	Wed 4/4/18
					3 days	Mon 4/2/18
					0 days	Wed 7/11/18
				m	133 days	Mon 1/8/18
				are	0 days	Mon 1/8/18
				re	130 days	Thu 1/11/18
					80 days	Thu 1/11/18
					10 days	Thu 1/11/18
					20 days	Thu 1/11/18
13	A	1.1.2.1.3	WP	Feature A3	20 days	Thu 1/25/18
14	A	1.1.2.1.4	WP	Feature A4	10 days	Thu 2/22/18
15	A	1.1.2.1.5	WP	Feature A5	20 days	Thu 3/8/18
16	A	1.1.2.1.6	WP	Feature A6	20 days	Thu 4/5/18
17	A	1.1.2.1.7	WP	Feature A7	10 days	Thu 4/19/18
18	B	1.1.2.2	CA	Capability B	40 days	Thu 5/3/18
19	C	1.1.2.3	CA	Capability C	50 days	Thu 5/3/18



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1.1.2.1.1	**WP**	**Feature A1**	**A**			**9**	**9**	**100%**	**$ 2,000.00**
		Story A1.1	A	1	1	2	2	100%	
		Story A1.2	A	1	1	5	5	100%	
		Story A1.3	A	1	2	2	2	100%	
1.1.2.1.2	**WP**	**Feature A2**	**A**			**19**	**19**	**100%**	**$ 2,500.80**
		Story A2.1	A	2	2	3	3	100%	
		Story A2.2	A	1	1	5	5	100%	
		Story A2.3	A	2	2	8	8	100%	
		Story A2.4	A	2	3	3	3	100%	
1.1.2.1.3	**WP**	**Feature A3**	**A**			**18**	**18**	**100%**	**$ 2,800.00**
		Story A3.1	A	2	2	2	2	100%	
		Story A3.2	A	3	3	8	8	100%	
		Story A3.3	A	3	4	3	3	100%	
		Story A3.4	A	3	3	5	5	100%	
1.1.2.1.4	**WP**	**Feature A4**	**A**	**4**		**14**	**9**	**64%**	**$ 2,800.00**
		Story A4.1	A	4		2	2	100%	
		Story A4.2	A	4	4	3	3	100%	
		Story A4.3	A	4	4	1	1	100%	
		Story A4.4	A	4	4	5		0%	
		Story A4.5	A	4	4	3	3	100%	
1.1.2.1.5	**WP**	**Feature A5**	**A**	**5,6**		**19**		**0%**	**$ 2,500.80**
1.1.2.1.6	**WP**	**Feature A6**	**A**	**6,7**		**17**		**0%**	**$ 1,920.00**
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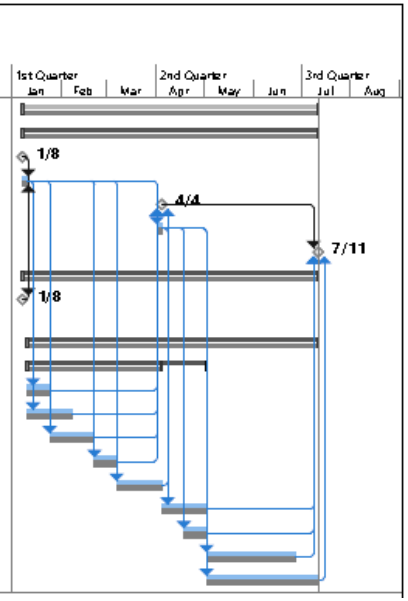
Total						**192**			

1) Story Completion Rolled up to Feature % Complete
2) Feature % Complete Put into Schedule
3) IMS Informs EVM as always

					Duration	Start
9		1.1.2		Prime Mission Software	130 days	Thu 1/11/18
10		1.1.2.1	CA	Capability A	80 days	Thu 1/11/18
11	A	1.1.2.1.1	WP	Feature A1	10 days	Thu 1/11/18
12	A	1.1.2.1.2	WP	Feature A2	20 days	Thu 1/11/18
13	A	1.1.2.1.3	WP	Feature A3	20 days	Thu 1/25/18
14	A	1.1.2.1.4	WP	Feature A4	10 days	Thu 2/22/18
15	A	1.1.2.1.5	WP	Feature A5	20 days	Thu 3/8/18
16	A	1.1.2.1.6	WP	Feature A6	20 days	Thu 4/5/18
17	A	1.1.2.1.7	WP	Feature A7	10 days	Thu 4/19/18
18	B	1.1.2.2	CA	Capability B	40 days	Thu 5/3/18
19	C	1.1.2.3	CA	Capability C	50 days	Thu 5/3/18
					133 days	Mon 1/8/18
					133 days	Mon 1/8/18
					0 days	Mon 1/8/18
					3 days	Mon 1/8/18
					0 days	Wed 4/4/18
					3 days	Mon 4/2/18
					0 days	Wed 7/11/18
					133 days	Mon 1/8/18
					0 days	Mon 1/8/18



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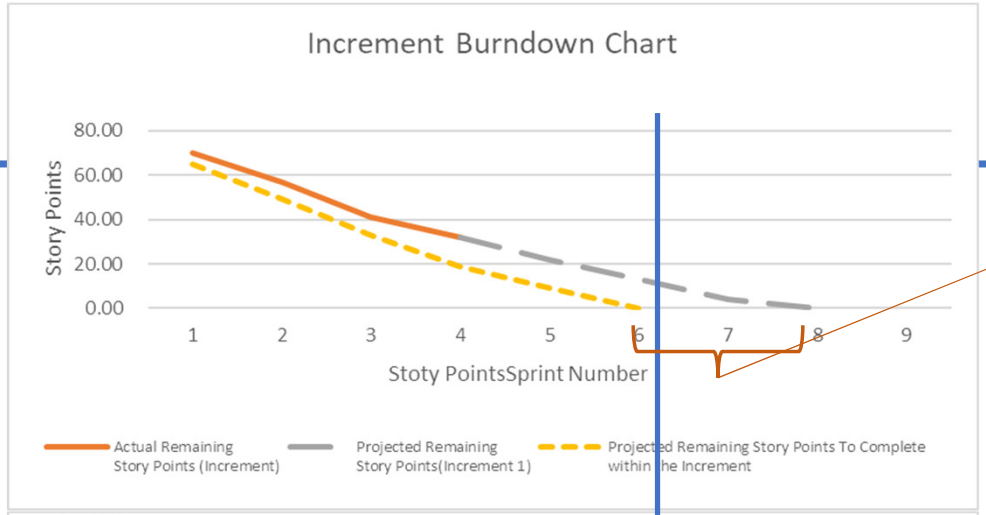

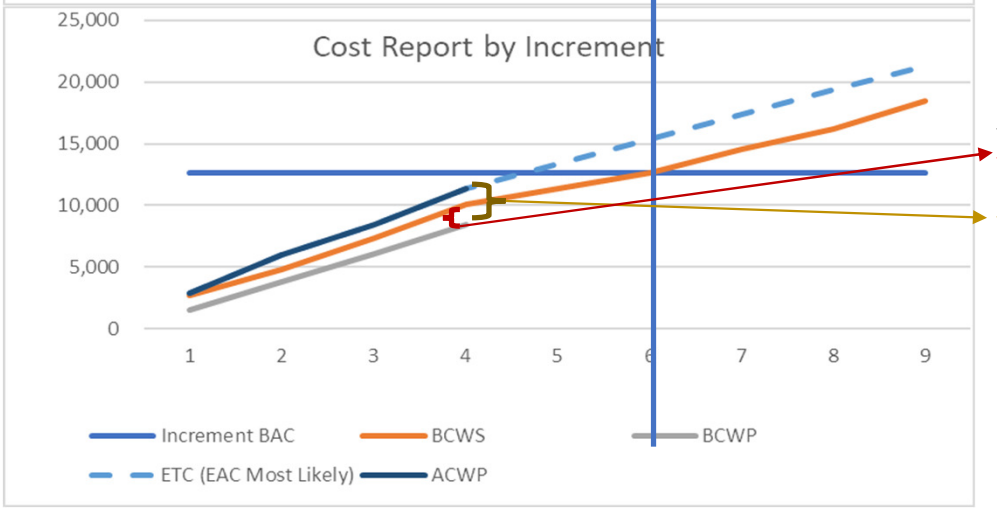

Agile Metrics Inform Technical Progress
- Burndown Chart Indicates Progress is Lagging Plan
- Says nothing about expenditure of resources

EVM Metrics Informed by Agile in Dollars
- Burndown Chart Indicates Progress is Lagging Plan
- Shows Negative Technical Progress (SV = BCWS – BCWP)
- In addition, EVM metrics show Negative Cost Variance. (CV = ACWP – BCWP)

CAUTION:
This Chart shows EVM and Agile by Sprint.
EVM is typically done by Month instead of by Sprint.

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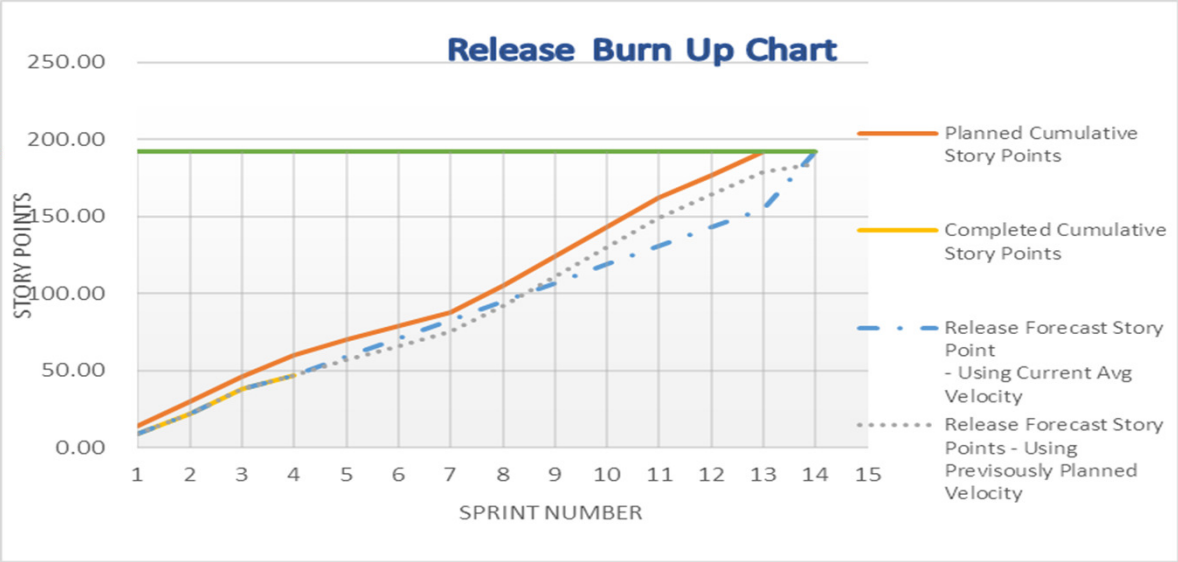
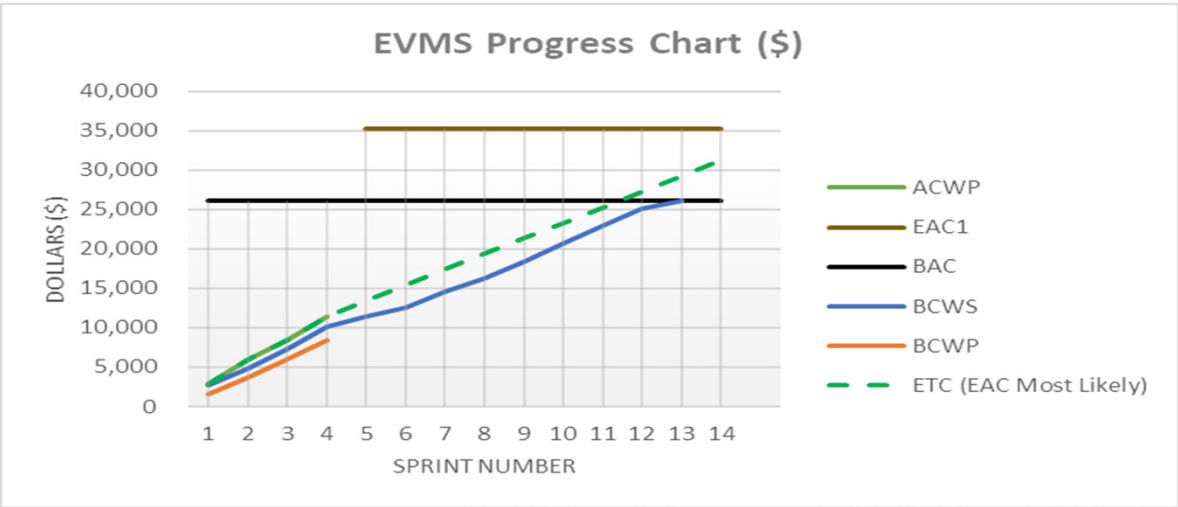


Agile Metric Showing Planned Vice Projected # of Sprints Based on Performance



EVM Typically does not Project Performance except through CV and SV metrics in terms of cost.

Agile and EVM Metrics must be evaluated together to perform analysis

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Agile Metrics and EVM Metrics

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Agile Metrics (Sprints)	1	2	3	4
(Story Points) Planned Velocity	14	16	16	14
(Story Points) Actual Velocity	9	13	16	9
(Story Points) Actual Cum	9	22	38	47
Planned % Complete	18%	38%	58%	76%
% Complete Story Points (Cum)	11%	28%	48%	59%
AVG Velocity	9	11	13	12
Predicted Remaining Number of Sprints	15	15	15	16
Required Velocity to Complete (12 Sprints)	16	15	15	16

Agile Metrics Provide only Technical Progress but Inform EVM Progress

Earned Value Metrics (Cumulative)	1	2	3	4
BAC	26,177	26,177	26,177	26,177
Increment BAC	12,602	12,602	12,602	12,602
BCWS	2,658	4,812	7,301	10,101
BCWP	1,547	3,759	6,056	8,457
ACWP	2,893	5,993	8,393	11,393
CV	(1,346)	(2,234)	(2,337)	(2,936)
SV	(1,111)	(1,053)	(1,244)	(1,644)
CPI	0.53	0.63	0.72	0.74
SPI	0.58	0.78	0.83	0.84

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Questions?

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