



Project Control
Academy



PRESENTED BY:

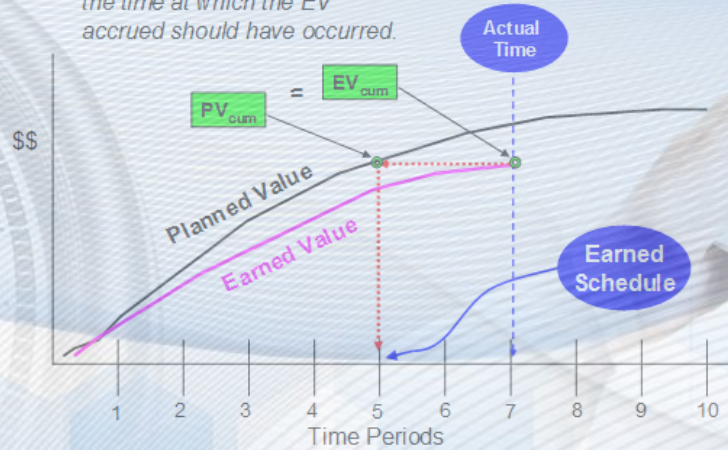
Walter Lipke

The Creator of Earned Schedule

EARNED SCHEDULE

AN EVOLUTION OF EARNED VALUE MANAGEMENT

The ES idea is to determine the time at which the EV accrued should have occurred.



Reward for those who stay until the end....

1.5 PDUs & a PDF copy of the Slides, and Takeaway Resources



INTRODUCTIONS



Shohreh Ghorbani



- **Founder & Director, Project Control Academy**
- **Creator of the following training programs:**
 - Applied Project Controls Training
 - Essentials of Earned Value Management
 - Mastering EVM for Project Success
 - Project Scheduling Blueprint
 - Project Control Career Success Roadmap
- **Served tens of thousands of professionals worldwide to take their project controls skills to the next level.**



Walter Lipke

- **Retired in 2005 as deputy chief of the Software Division at Tinker Air Force Base, where he led the organization to the 1999 SEI/IEEE award for Software Process Achievement.**
- **The creator of the Earned Schedule technique, which extracts schedule information from earned value data.**
- **Licensed Professional Engineer**
- **Holds a Master of Science in Physics**



Walter Lipke

Honors & Awards

- Academic honors - Phi Kappa Phi ($\Phi\text{K}\Phi$)
- PMI Metrics SIG Scholar Award (2007)
- PMI Eric Jenett Award (2007)
- Who's Who in the World (2010)
- EVM Europe Award (2013)
- CPM Driessnack Award (2014)
- Australian Project Governance and Control Symposium established the annual Walt Lipke Project Governance and Control Excellence Award (2017)
- Albert Nelson Marquis Lifetime Achievement Award (2018)



WHAT TO EXPECT IN THE NEXT 1.5 HOURS....

A close-up photograph of a hand holding a blue marker, writing the word 'Agenda!' in a large, flowing cursive script on a white surface. The background is blurred, showing a person's face. The word 'Agenda!' is underlined with a single horizontal stroke.



Abstract

Earned Schedule is an extension to Earned Value Management. The method provides considerable capability to project managers for analysis of schedule performance. From the time of the public's first view of Earned Schedule, its propagation and uptake around the world has been extraordinary. This presentation will cover the capabilities, affirmation, and resources available supporting the practice.



Planning

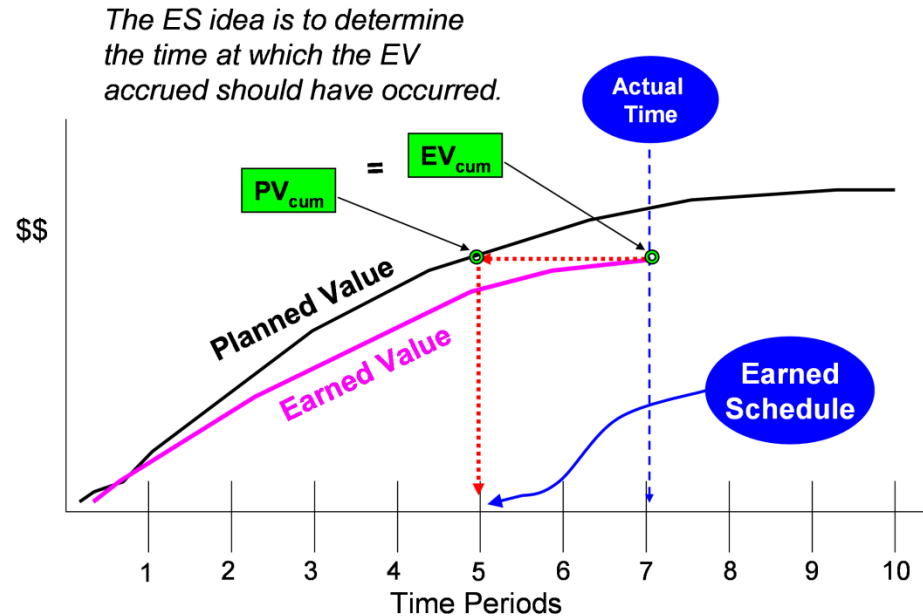
“Planning is an unnatural process; it is much more fun to do something. The nicest thing about not planning is that failure comes as a complete surprise, rather than being preceded by a period of worry and depression.”

-Sir John Harvey-Jones



Overview

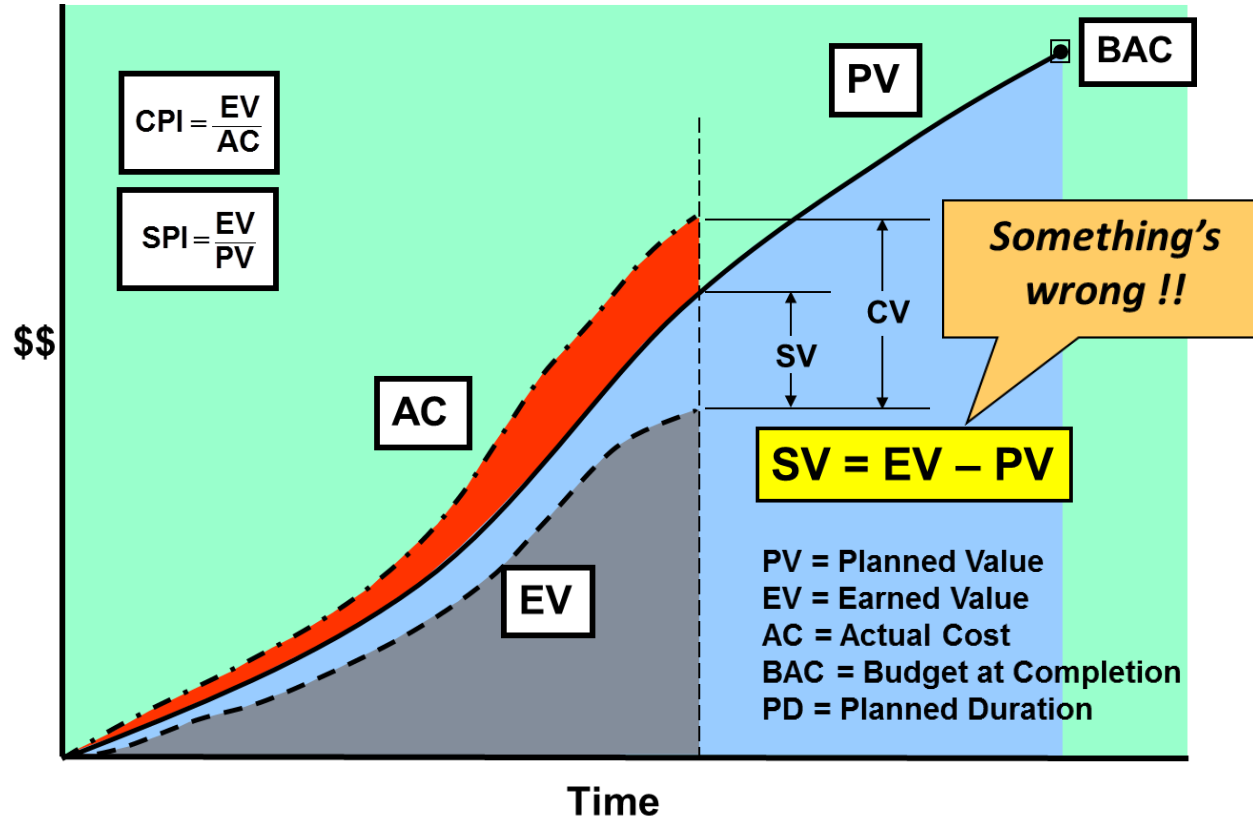
- Description
- Computation
- Capabilities
- Affirmation
- Resources
- Summary





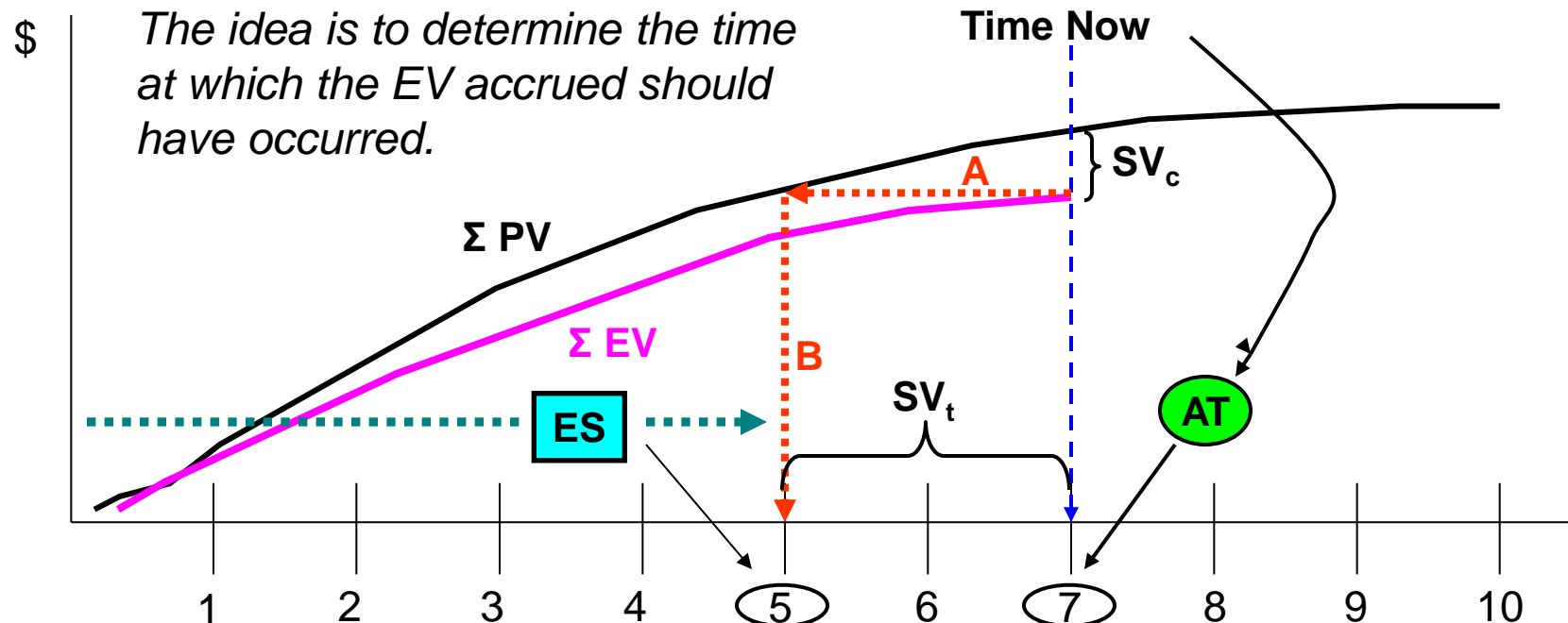
DESCRIPTION

EVM Schedule Indicators





Earned Schedule Concept



For the above example, ES = 5 months ...that is the time associated with the PMB at which PV equals the EV accrued at month 7.



Earned Schedule Concept

- Formula

- $ES = C + I$

where: C = number of time increments for $EV \geq PV$

$$I = (EV - PV_C) / (PV_{C+1} - PV_C)$$

- Indicators

- Schedule Variance: $SV(t) = ES - AT$

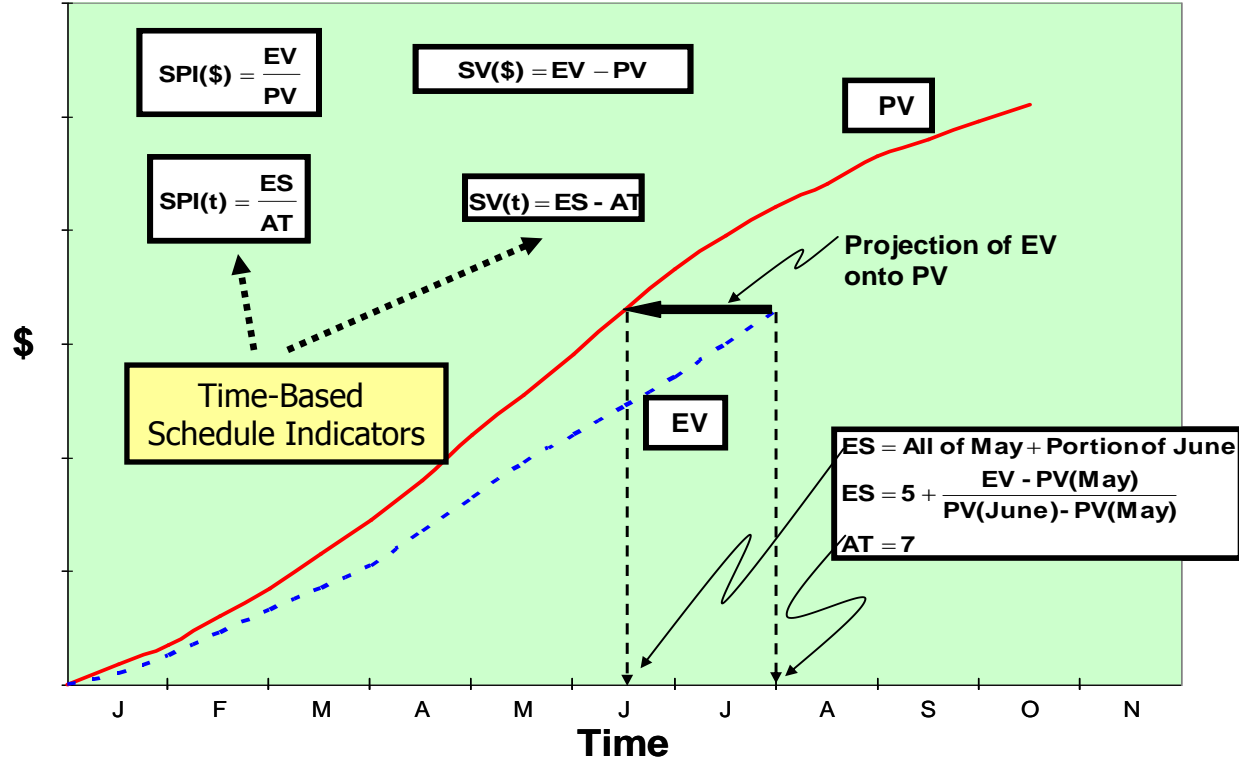
- Schedule Performance Index: $SPI(t) = ES / AT$



ES COMPUTATION



ES Computation Example





ES Computation Example

Earned Schedule requires the:

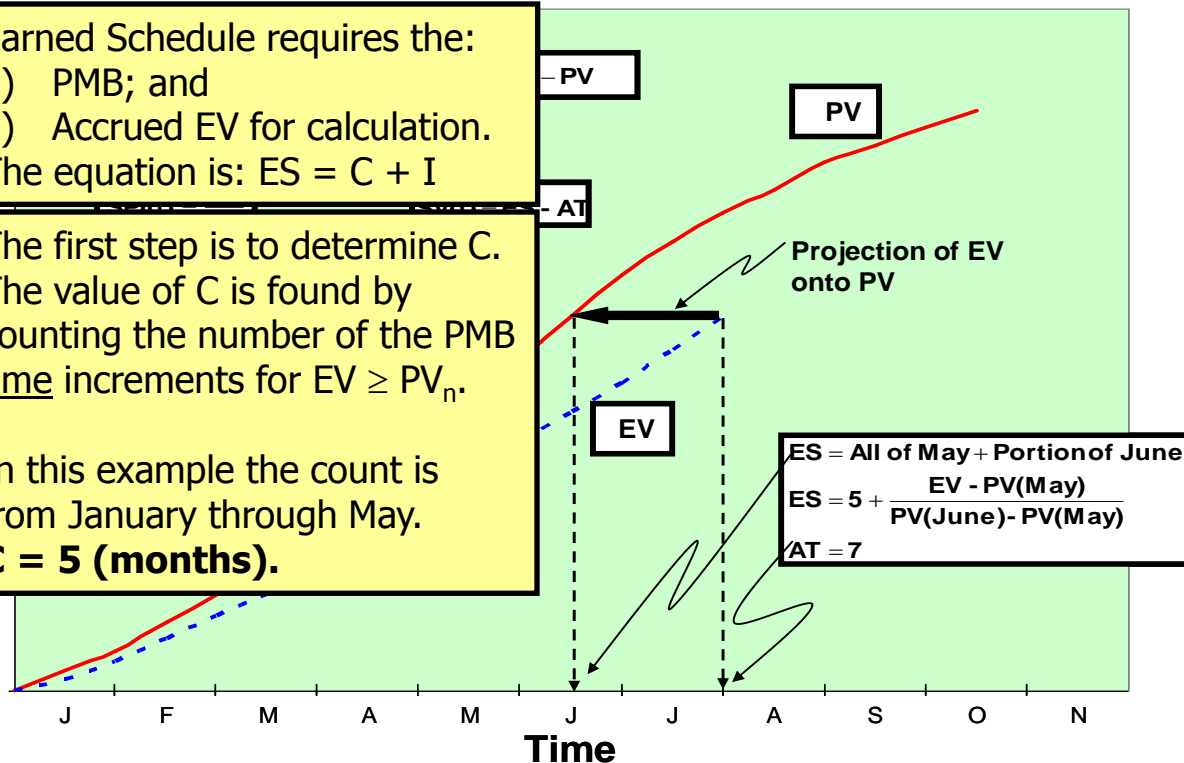
- 1) PMB; and
- 2) Accrued EV for calculation.

The equation is: $ES = C + I$

The first step is to determine C. The value of C is found by counting the number of the PMB time increments for $EV \geq PV_n$.

In this example the count is from January through May.

C = 5 (months).





ES Computation Example

Thus far, $ES = 5 + I$ (months).
In the small box at the lower right,
is the equation for calculating I .
For the example, let

- 1) $EV = 100$
- 2) PV_5 (May) = 90
- 3) PV_6 (June) = 110.

Let's calculate I :
 $I = (100 - 90) / (110 - 90) = 0.5$

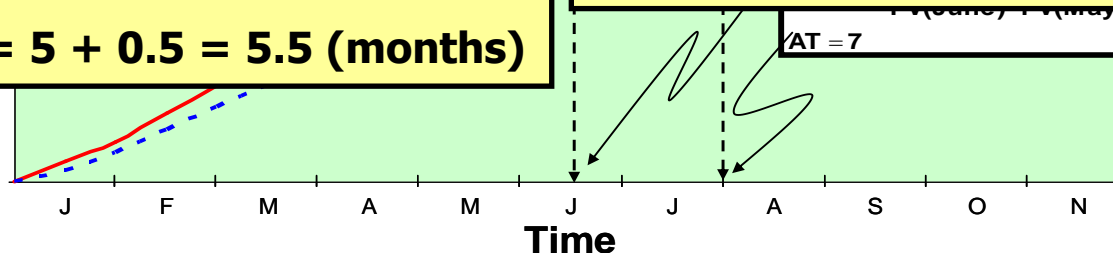
$ES = 5 + 0.5 = 5.5$ (months)

From ES (5.5 months) we can now
calculate the ES indicators:
 $SV(t)$ and $SPI(t)$.

The EV is reported at Actual Time
 $AT = 7$, the end of July.

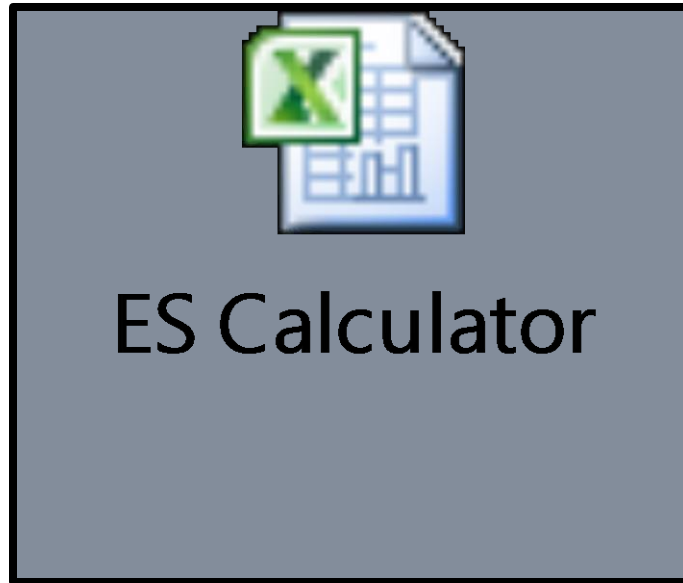
$$SV(t) = 5.5 - 7 = -1.5 \text{ months}$$

$$SPI(t) = 5.5 / 7 = 0.79$$





Earned Schedule Calculator



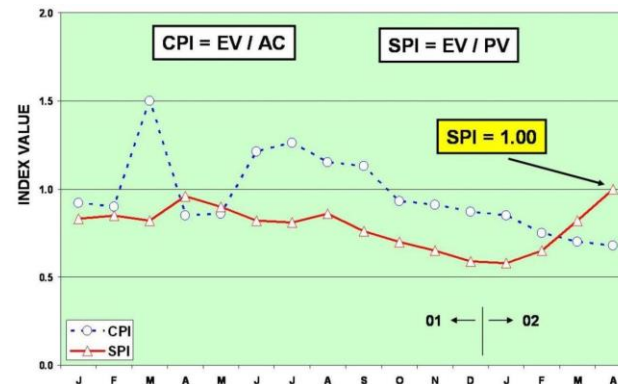
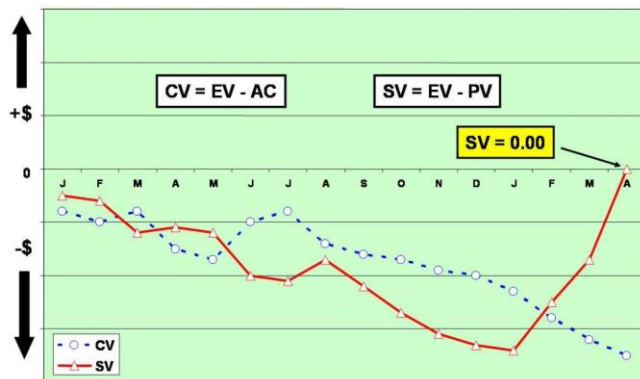


CAPABILITIES



Capabilities

- Reliable indicators – $SV(t)$ & $SPI(t)$
 - True performance at completion

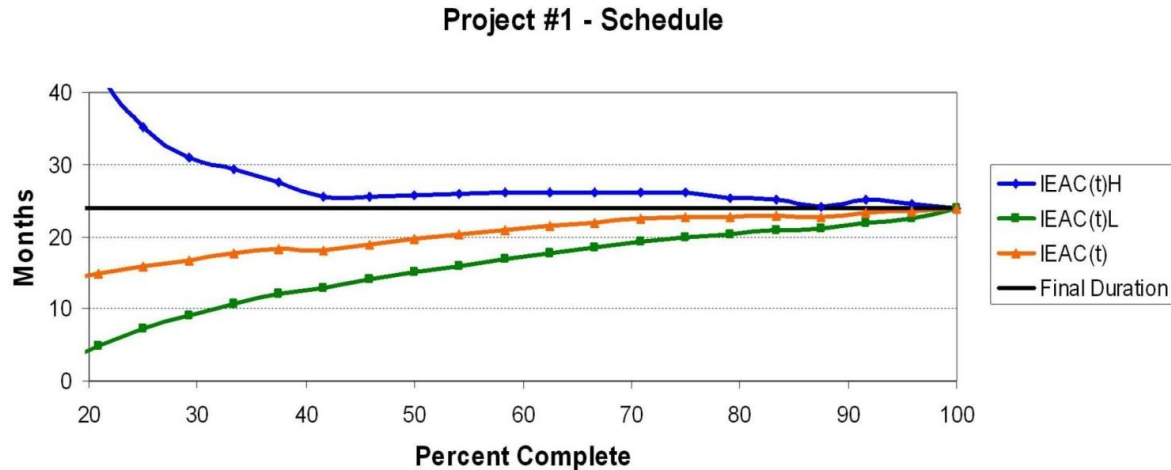


EVM schedule indicators fail for late performing projects



Capabilities

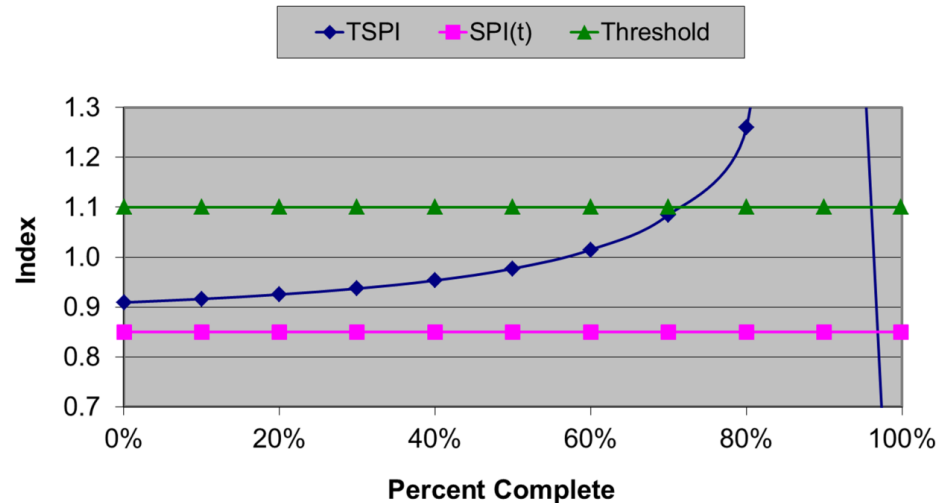
- Forecasting
 - Duration & completion date
 - Always converges to actual result





Capabilities

- Prediction
 - To Complete Schedule Performance Index (TSPI)
 - Answers question – “Is completion at (time) achievable?”





Capabilities

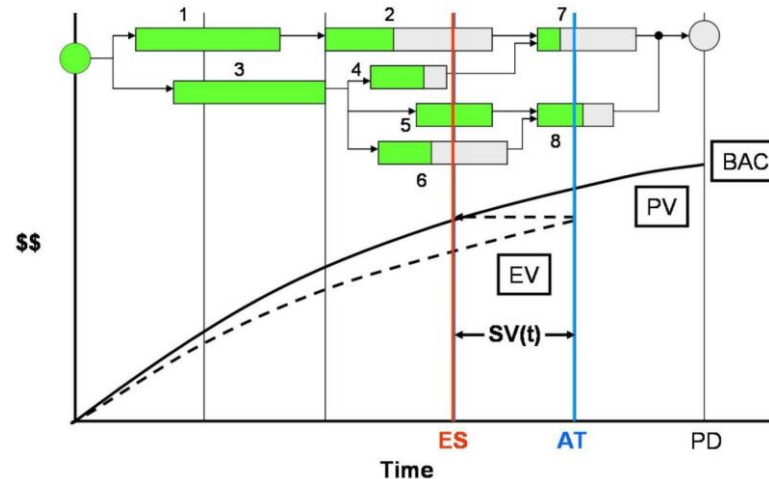
- Critical Path
 - Comparison of project and CP performance

		... Performance Period ...												
	Indicator	0	1	2	3	4	5	6	7	8	9	10	11	12
Total Project	CPIp	xxx	xxx	0.800	0.800	0.827	0.771	0.900	0.838	0.727	0.900	0.750	0.600	1.000
	CPic	xxx	xxx	0.800	0.800	0.818	0.804	0.818	0.822	0.812	0.816	0.810	0.805	0.808
	SPI(t)p	xxx	0.000	0.800	1.486	1.314	0.775	0.450	0.975	0.700	0.450	1.950	0.500	0.600
	SPI(t)c	xxx	0.000	0.400	0.762	0.900	0.875	0.804	0.829	0.813	0.772	0.890	0.855	0.833
	SPIp	xxx	0.000	0.800	0.457	1.433	0.675	0.600	1.550	3.200	0.900	3.000	xxx	xxx
	SPIc	xxx	0.000	0.400	0.444	0.840	0.783	0.745	0.842	0.912	0.911	0.968	0.984	1.000
	IEAC(t)	xxx	xxx	25.00	13.13	11.11	11.43	12.44	12.07	12.31	12.95	11.24	11.70	12.00
Critical Path 1-4-8-10	CPIp	xxx	xxx	0.800	0.800	0.833	0.600	xxx	0.800	0.667	xxx	0.714		
	CPic	xxx	xxx	0.800	0.800	0.815	0.781	0.781	0.787	0.763	0.763	0.753		
	SPI(t)p	xxx	0.000	0.800	1.600	2.000	0.600	0.000	1.700	1.300	0.000	2.000		
	SPI(t)c	xxx	0.000	0.400	0.800	1.100	1.000	0.833	0.957	1.000	0.889	1.000		
	SPIp	xxx	0.000	0.800	1.600	2.000	0.600	0.000	1.200	1.600	0.000	2.000		
	SPIc	xxx	0.000	0.400	0.800	1.100	1.000	0.833	0.925	1.000	0.900	1.000		
	IEAC(t)	xxx	xxx	25.00	12.50	9.09	10.00	12.00	10.45	10.00	11.25	10.00	xxx	xxx



Capabilities

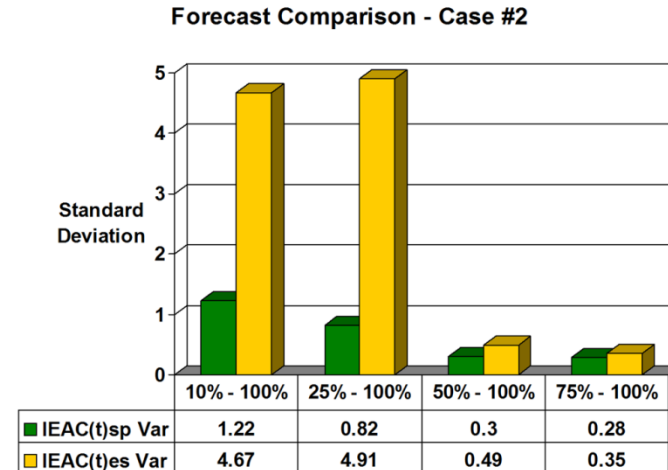
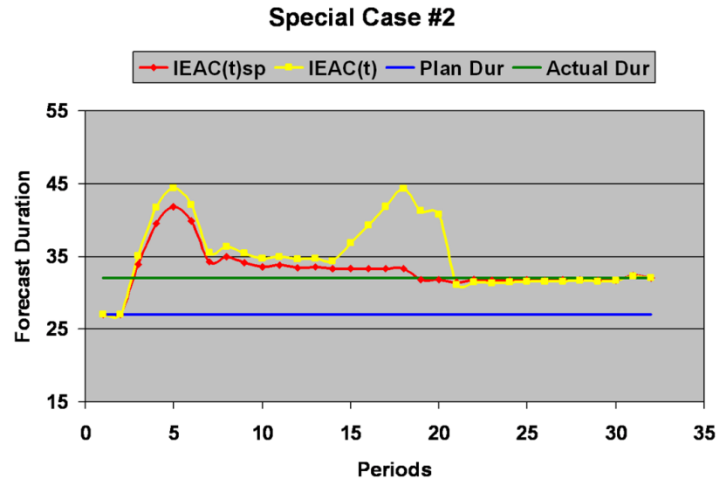
- Detail Analysis – Schedule Adherence
 - Identifies out of sequence performance
 - Isolates tasks - constraints/impediments & rework
 - Facilitates calculations - SA metric & rework forecast





Capabilities

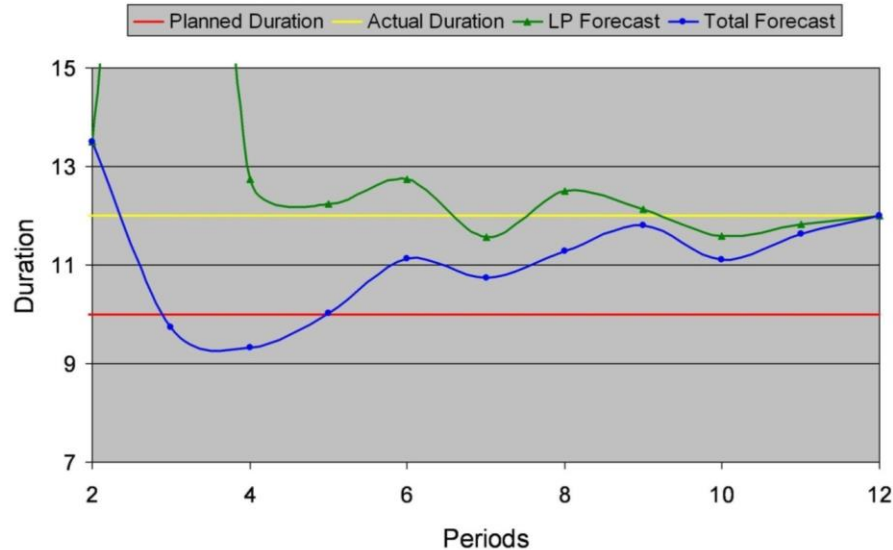
- Discontinuous performance – stop work & downtime
 - Accommodates and improves forecasting





Capabilities

- Schedule Topology
 - Longest path concept improves forecasts for parallel networks





Earned Schedule Terminology

Metrics	Earned Schedule	ES_{cum}	ES = C + I number of periods (C), EV ≥ PV _C plus an incomplete portion (I)
	Actual Time	AT_{cum}	AT = number of periods executed
Indicators	Schedule Variance	SV(t)	SV(t) = ES – AT
		SV(t)%	SV(t)% = (ES – AT) / ES
	Schedule Performance Index	SPI(t)	SPI(t) = ES / AT
Predictor	To Complete Schedule Performance Index	TSPI	TSPI = (PD – ES) / (PD – AT)
			TSPI = (PD – ES) / (ED – AT)
Forecasts	Independent Estimate at Completion (time)	IEAC(t)	IEAC(t) = PD / SPI(t)
			IEAC(t) = AT + (PD – ES) / PF(t)
	Variance at Completion (time)	VAC(t)	VAC(t) = PD – IEAC(t) or ED



AFFIRMATION



Affirmation

- Simple theory
- Initial prototype
- Independent confirmation
 - Trials
 - Testing
 - Usage
- EVM Tools
- Educators/Researchers
- Standards & Guides
- Awards



Affirmation

- Simple theory
- Initial prototype
- Independent confirmation
 - Trials

“The retrospective analysis of ES using my own EVM projects’ data, ... has confirmed with remarkable precision the accuracy of the ES concept and ES metrics ...when compared to their historic EVM counterparts.”

- Henderson (2003)

- Awards



Affirmation

- Simple theory

“The results reveal that the earned schedule method outperforms, on the average, all other forecasting methods.”

- Vanhoucke & Vandevorde (2007)

- Testing

“This research finds Earned Schedule to be a more timely and accurate predictor than Earned Value Management.”

- Capt. Kevin Crumrine (2013)

- Standards & Guides

- Awards



Affirmation

Evidence of Earned Schedule Usage				
Application	USA	Lockheed-Martin Boeing Booze-Allen-Hamilton Government & Defense	Projects are generally extremely large, running for a decade or more and costing in excess of \$1 Billion.	
	Australia UK Belgium Kazakhstan India	Private & Defense Network Rail & Defense Fabricom (GDF-SUEZ) Petroleum Development Building Construction		
University Coursework	USA	George Washington University, Drexel, University of Houston, University of Nevada (Reno), West Virginia University, Pennsylvania State University		
	non-USA	University of Ghent (Belgium), Australian National University		
Books	USA	<i>Earned Schedule</i> by Walter H. Lipke <i>Project Management Theory and Practice</i> by Dr. Gary L. Richardson <i>The Earned Value Maturity Model</i> by Ray W. Stratton <i>A Practical Guide to Earned Value Management, 2nd Edition</i> by Charles & Charlene Budd <i>Project Management Achieving Competitive Advantage</i> by Jeffrey K. Pinto <i>Practice Standard for Earned Value Management</i> by Project Management Institute		
	non-USA	<i>Measuring Time: Improving Project Performance Using Earned Value Management</i> by Dr. Mario Vanhoucke <i>Earned Schedule - an emerging Earned Value technique</i> issued by UK APM EVM SIG		



Affirmation

- Simple theory

- ❖ PMI Practice Standard for EVM
- ❖ PMI Project Management Body of Knowledge
- ❖ PMI Practice Standard for Scheduling (pending)
- ❖ NDIA Predictive Measures Guide
- ❖ NDIA Planning and Scheduling Excellence Guide
- ❖ ISO Standard for EVM
- ❖ Australian Standard for EVM (in work)

- Standards & Guides
- Awards





SUMMARY



Summary

- Derived from EVM data ... only
- Provides time-based schedule indicators
- Indicators do not fail for late finish projects
- Application is scalable up/down, just as is EVM
- Schedule forecasting & analysis is better than any other EVM method presently used
 - $SPI(t)$ & $SV(t)$ behave similarly to CPI & CV
 - $IEAC(t) = PD / SPI(t)$ behaves similarly to $IEAC = BAC / CPI$



Summary

- Schedule performance analysis – much easier and possibly better than “bottom-up” methods
- Application is growing in both small and large projects
- Practice recognized in Standards & Guides
- Resource availability enhanced with ES website and Wikipedia
- Research indicates ES superior to other methods

Hopefully you are encouraged to – Give ES a try!

ADDITIONAL RESOURCES



Download Webinar Resources & Slides....

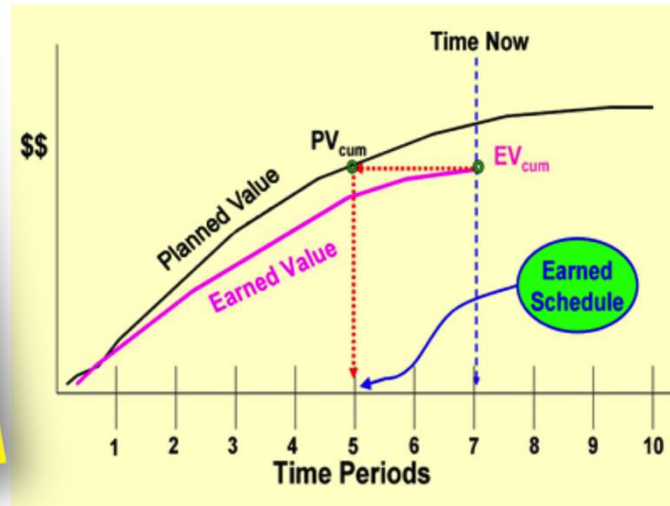
Click on the link in the yellow sticky note above the chat box to download...





Earned Value Management (EVM) is a wonderful management system, integrating in a very intriguing way, cost ...schedule ...and technical performance. It is a system, however, that causes difficulty to those just being introduced to its concepts. EVM measures schedule performance not in units of time, but rather in cost, i.e. dollars. After overcoming this mental obstacle, we later discover another quirk of EVM: at the completion of a project which is behind schedule, Schedule Variance (SV) is equal to zero, and the Schedule Performance Index (SPI) equals unity. We know the project completed late, yet the indicator values say the project has ...perfect schedule performance!!

- ✓ Papers,
- ✓ Presentations,
- ✓ Calculators,
- ✓ Terminology
- ✓ Standards & Guides
- ✓



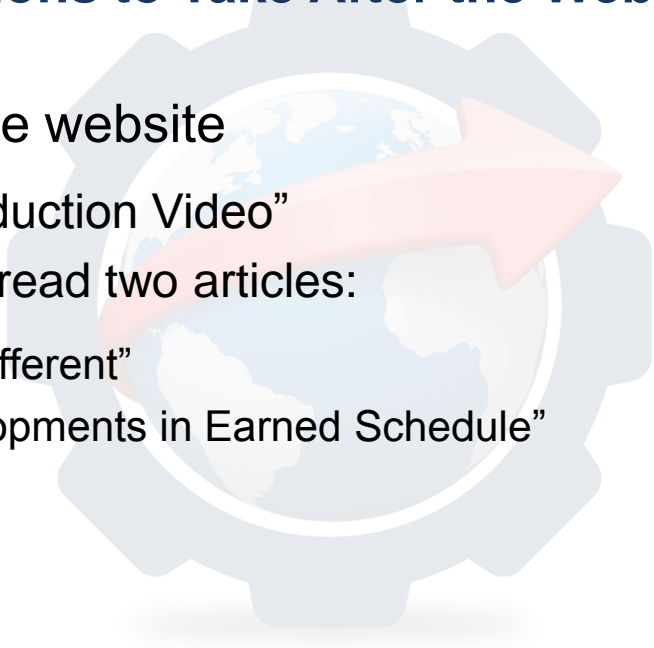
ES resolves the long-standing dilemma of the EVM schedule indicators providing false information for late performing projects.

Earned Schedule (ES) is a breakthrough analytical technique that resolves the EVM dilemma. It is derived from and is an extension to EVM. No additional data is needed for acquiring the ES measures; only the

- [Introductory Video](#)
- [Concept Description](#)
- [Forecasting Reliability](#)
- [EVM Time Forecasting](#)
- [Contacts](#)
- [Training Sources](#)
- [Sites of Interest](#)
- [EVM - ES Tools](#)
- [ES Book](#)
- [ES Book \(translations\)](#)
- [Copyrights & Trademarks](#)
- [EVM History](#)

Earned Schedule Website

Recommended Actions to Take After the Webcast

- 
- To Begin ...use the website
 - ⦿ View the “Introduction Video”
 - ⦿ Download and read two articles:
 - “Schedule is Different”
 - “Further Developments in Earned Schedule”

Recommended Actions to Take After the Webcast

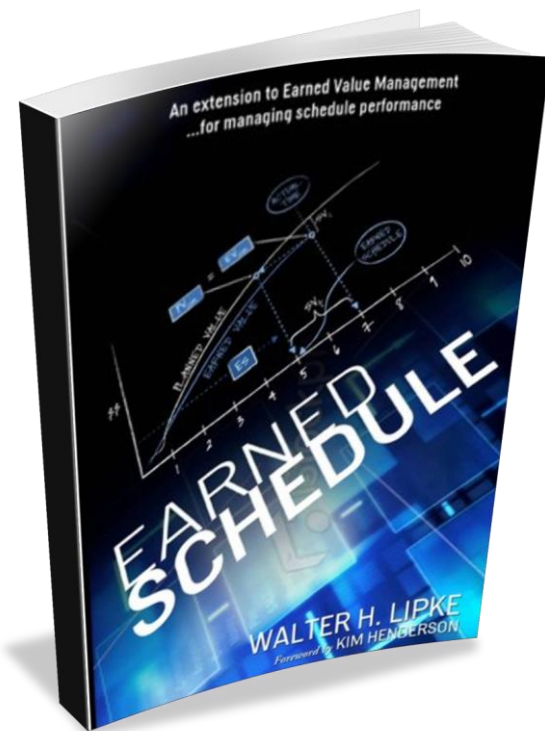
- Scan the Calculators ...experiment with them
 - ES Calculator (v1b)
 - P-Factor Calculator
 - Statistical Forecasting Calculator
 - SA Index & Rework Calculator
 - Prediction Analysis Calculator



Earned Schedule Book

Read the Earned Schedule Book by Walter Lipke

- This book is intended for those who use Earned Value Management (EVM).
 - Now available in English, Japanese, Portuguese, Spanish.
 - Available in both Kindle & Paperback





Contacts

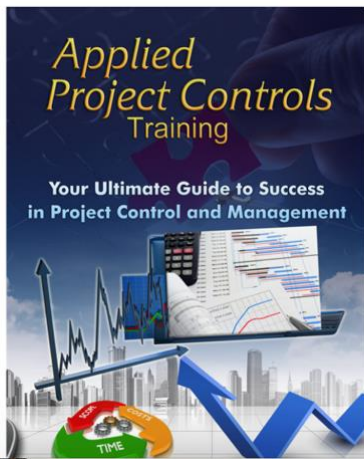
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Training Courses

www.ProjectControlAcademy.com

At Project Control Academy, we provide top quality and creative training programs in project controls, project management, and project leadership. Here is a list of our current on-demand online training courses:

Applied Project Controls

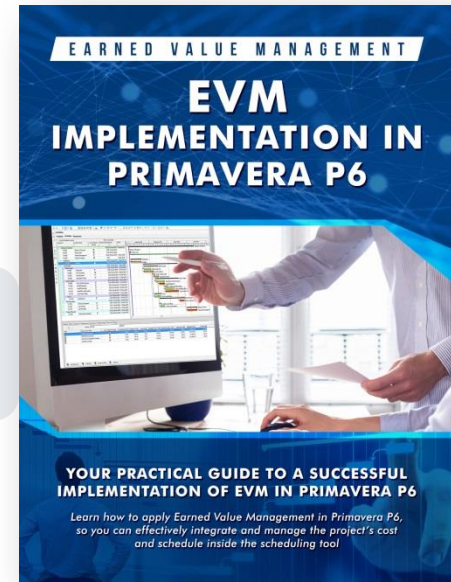
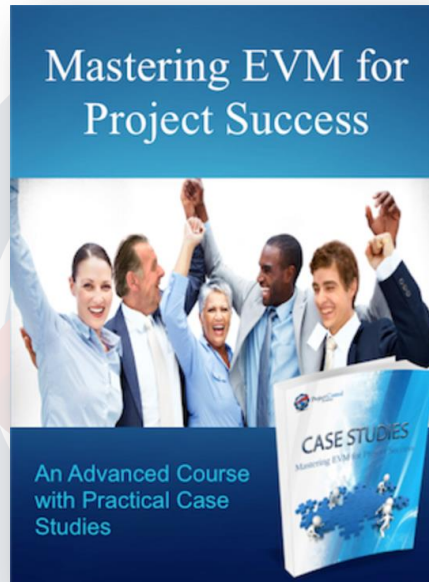
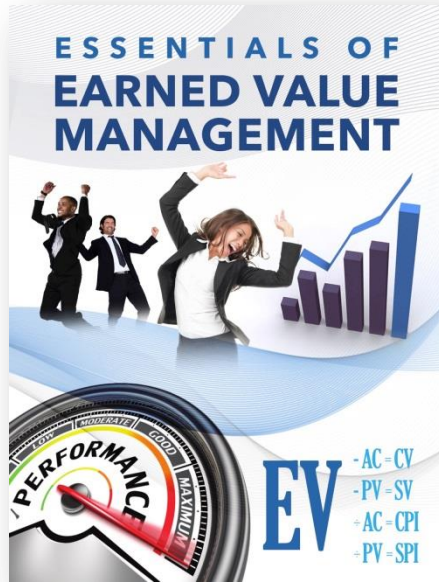


A project with poor control is a project that is out of control. Applied Project Controls training provides you fundamental and practical applications of effective project controls.

Whether you are a project manager, a project controller, or a lead, this comprehensive course packages the things you need to know about project controls in a simple and structured way. It equips you with the right tools and gives you a deeper level of understanding to boost your competency in controlling your projects. This course illustrates how to effectively plan, control, monitor, and forecast a project's schedule and cost. More importantly, it shows you how to develop the project's plans and processes so that schedule and cost control are achievable goals.

Closely aligned with the Project Management Institute's standards and guidelines, Applied Project Controls training looks at basic and advanced methods for keeping your projects in control and

Take In-depth Training Programs on EVM



www.ProjectControlAcademy.com/Training

QUESTIONS?

