Earned Value Management



The Problem

Gantt charts are great tools, but often don't immediately tell us what we'd like or need to know.





EVM Definitions



Earned Value Management (EVM)

Statistical technique to track project performance versus plan.

Standardizes comparisons across diverse projects and programs.

Will show you:

Percent ahead or behind schedule Percent over or under budget "Real" dollars and time you are ahead or behind in your project work.

Is a crude predictor of future performance

Not all numbers matter equally



Not all numbers matter equally

Many leaders freak out over numbers.

There is a massive difference in being 20% late or over budget on a:



\$10,000 project or a **\$10,000,000** project

EVM Definition: Planned Value (PV)

Authorized budget for an activity or task

Generally referred to in the cumulative

Total PV for all the tasks at a point in time

The total PV for a project IS the budget

Also known as Budget at Completion (BAC)



EVM Definition: Actual Costs (AC)

The total cost incurred and recorded in completing the work

How much have we spent?

Also known as Actual Cost of Work Performed (ACWP)



EVM Definition: Earned Value

The value of work performed to date

Theoretically, the price we would fetch for the project today

Always a percentage of BAC, but can exceed PV at a point in time



A simple example

We need to upgrade our living room and TV this week before the "big game" on Saturday.

We budget, seek our partner's guidance, and create a plan.



Budget at Completion: Living Room Upgrade





(\$400+ \$250+\$1,000+\$2,000)

Budget at Completion (BAC): \$3,650

The Famous Cookie Project



Our delicious cookie project

After promising to bake 1,000 cookies for the school fair tomorrow, your spouse has curiously fallen ill at dinner time.

Through planning, you estimate that you can make:

5 batches of 40 cookies every hour, at a cost of (no more than) \$0.05 per cookie.



Projectizing our cookie making...



Getting the budget figured out...



1 Hour into our Cookie Project



1 Hour into our Cookie Project



1 Hour into our Cookie Project



But what have we SPENT to get to this point?



Why do the numbers matter?

Effective project management is about understanding and directing where your people and money are spent.

We are going to learn the difference between PERFORMANCE and VARIANCE within your projects and programs.



Project Performance

The differential PERCENTAGE your project is over or under against the project plan.



Schedule and Cost Performance Index

Schedule Performance Index (SPI) gives us a snapshot of the overall time and shows us how we are doing as a PERCENTAGE.

Cost Performance Index (CPI) gives us a snapshot of the overall cost and shows us how we are doing as a PERCENTAGE.



Schedule and Cost Performance Index

Schedule Performance Index (SPI) gives us a snapshot of the overall time and shows us how we are doing as a PERCENTAGE.

SPI = Earned Value / Planned Value

SPI = EV / PV

Cost Performance Index (CPI) gives us a snapshot of the overall cost and shows us how we are doing as a PERCENTAGE.

CPI = Earned Value / Actual Costs

CPI = EV / AC



SPI or CPI > 1.0 We are (x%) **ahead** of plan

> **SPI or CPI = 1.0** We are **on** plan

X

SPI or CPI < 1.0

We are (x%) **behind** plan

How is the cookie project performing after the 1st hour?

SPI = EV / PV

SPI = Earned Value / Planned Value CPI = Earned Value / Actual Costs

CPI = EV / AC



How is the cookie project performing after the 1st hour?

SPI = Earned Value / Planned Value CPI = Earned Value / Actual Costs

SPI = EV / PV

SPI = \$7.50 / \$10.00

SPI = ??

CPI = EV / ACtual Costs

CPI = \$7.50 / \$9.00

CPI = ??

How is the cookie project performing after the 1st hour?

SPI = Earned Value / Planned Value

SPI = EV / PV

SPI = \$7.50 / \$10.00

SPI = 0.75

We are 25% behind schedule

SPI < 1.0 We are (x%) **behind** schedule **CPI = Earned Value / Actual Costs**

CPI = EV / AC

CPI = \$7.50 / \$9.00

CPI = 0.83

We are 17% over costs



CPI < 1.0

We are (x%) over costs

Performance vs Variance

Performance is the differential PERCENTAGE your project is over or under against the project plan.

VARIANCE is the actual amount of DOLLARS and/or TIME your project is over or under within your BUDGET or SCHEDULE



Schedule Variance (SV)

SV shows how far over / under schedule the project is in TIME.

SV = Earned Value - Planned Value

SV = EV - PV



Cost Variance (CV)

CV shows how far over / under budget the project is in DOLLARS

CV = Earned Value - Actual Costs

CV = EV - AC





Schedule Variance (SV)

Cost Variance (CV)

SV = Earned Value - Planned Value

CV = Earned Value - Actual Costs



Schedule Variance (SV)

SV = Earned Value - Planned Value

SV = \$7.50 - \$10.00

Cost Variance (CV)

CV = Earned Value - Actual Costs

CV = \$7.50 - \$9.00

Schedule Variance (SV)

SV = Earned Value - Planned Value

SV = \$7.50 - \$10.00

SV = -2.5

Cost Variance (CV)

CV = Earned Value - Actual Costs

CV = \$7.50 - \$9.00

CV = -\$1.50

Schedule Variance (SV)

SV = Earned Value - Planned Value

SV = \$7.50 - \$10.00

SV = -2.5

Cost Variance (CV)

CV = Earned Value - Actual Costs

CV = \$7.50 - \$9.00

CV = -\$1.50

After first hour we can brief we are 2.5 hours behind plan \$1.50 over budget

We rarely do single projects

To utilize EVM we must learn to use the numbers to best understand where to provide support within multiple projects.



The Fence Project


We need a fence.

Scott is having 10 fellow Tampa CEOs over to his house on Friday for a puppy play date.

He needs to build a fence to allow the pups to play outside.

Through planning, Scott has found the following:

Fence materials will cost \$2,000

Angus and David (two CPTs with fence building experience) will cost Scott \$500 per day.



The plan comes together.



The plan comes together.



Day 1

Ending Monday, Angus and David completed all the North side of the fence and half of the East side.

David also was able to secure a 10% discount on materials (reducing the cost from \$2,000 to only \$1,800).

How much has the project "earned" and what are the Actual Costs?

Planned



Day 1: Answers

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David also was able to secure a 10% discount on materials (reducing the cost from \$2,000 to only \$1,800).

How much has the project "earned" and what are the Actual Costs?

Planned



How would we report how the fence project is performing?

How is the schedule "performing"? (SPI)

How are we tracking on our budget? (CPI)

How accurate was our plan? What costs are we going to have to absorb?



SPI = Earned Value / Planned Value CPI = Earned Value / Actual Cost

SPI = EV / PV

CPI = EV / AC

	Mon	Tue	Wed	Th
Planned Value (PV):	\$2,500	\$3,000	\$3,500	\$4,000
Earned Value (EV):	\$2,750			
Actual Costs (AC):	\$2,300			

SPI = Ea	arned V	alue /	Plann	ned Valı	le	CF	PI = Eai	rned Va	alue / Ao	ctual Cost
SPI = EV / PV						CPI = EV / AC				
	SPI = \$	2,750 /	1 \$2,50	00			CF	PI = \$2,7	′50 / \$2,	300
		SPI = ?	?					CF	PI = <mark>??</mark>	
		P	anned V	alue (PV) [,]	Mon \$2 500	<i>Tue</i>	Wed	Th \$4,000		
		E	arned Va	ulue (EV):	\$2,750	\$3,000	\$3,500	<i>\$4,000</i>		
		4	Actual Co	sts (AC):	\$2,300					

SPI = Earned Value / Planned Value

SPI = EV / PV

SPI = \$2,750 / \$2,500

SPI = 1.1

CPI = Earned Value / Actual Cost

CPI = EV / AC

CPI = \$2,750 / \$2,300

CPI = 1.2

SPI > 1.0 We are (10%) AHEAD of schedule



CPI > 1.0 We are (20%) LOWER cost

Day 2



Day 2: Answers



How are we looking at the end of Day 2?

How is the schedule "performing"? (SPI)

How are we tracking on our budget? (CPI)



SPI = E	arned \	/alue	e / Pl	lanned Valı	Je	CF	PI = Ea	rned Value / Actual Cost
	SF	9I = EV	V / P	v				CPI = EV / AC
	SPI = \$	2,750	o / \$	3,000			CF	PI = \$2,750 / \$2,800
		SPI	= ??					CPI = ??
					Mon	Tue	Wed	Th
			Planı -	ned Value (PV):	\$2,500	\$3,000	\$3,500	\$4,000
			Earn	ved Value (EV):	\$2,750	\$2,750		
			ACIL		<i>\$2,300</i>	⊅∠, ठ∪∪		

SPI < 1.0 We are (8%) BEHIND schedule

E



CPI < 1.0 We are (2%) ABOVE cost

Day 3

Playing catchup on Wednesday, we completed the East side of the fence but were unable to start the west side due to Angus leaving machinery in the rain.

The repair to the damaged machinery added \$500 to the costs of the project.

How would we track and report this?





Day 3: Answers

Mon Tue Wed Th \$2500 NORTH SIDE Playing catchup on Wednesday, we completed \$500 EAST SIDE the East side of the fence but were unable to start the west side due to Angus leaving \$500 machinery in the rain. WEST SIDE This damaged machinery added \$500 to the SOUTH SIDE \$500 costs of the project. How would we track and report Th Mon Tue Wed this? Planned Value (PV): \$2500 \$3000 \$4000 \$3500 Earned Value (EV): \$2,750 \$2,750 \$3,000 Actual Costs (AC): \$2,800 \$2,300 \$3,800 Completed Planned **Behind**

How are we looking at the end of Day 3?

How is the schedule "performing"? (SPI) How are we tracking on our budget? (CPI)



SPI = Earned	l Valu	e / Pl	anned Valı	Je	CF	PI = Eai	rned Value / Actual Cost
2	SPI = E	:V / P	V				CPI = EV / AC
SPI =	\$3,00	0 / \$	3,500			CP	rl = \$3,000 / \$3,800
	SPI	= ??					CPI = ??
		Plann	ed Value (PV):	Mon \$2,500	<i>Тие</i> \$3,000	Wed \$3,500	Th \$4,000
		Earne	ed Value (EV):	\$2,750	\$2,750	\$3,000	
		Actu	al Costs (AC):	\$2,300	\$2,800	\$3,800	

SPI = Earned Value / Planned Val	ue	CF	PI = Eai	rned Value / Actual	Cost
SPI = EV / PV				CPI = EV / AC	
SPI = \$3,000 / \$3,500			CP	PI = \$3,000 / \$3,800	
SPI = . <mark>86</mark>				CPI = .79	
Planned Value (PV):	Mon \$2,500	<i>Тие</i> \$3.000	Wed \$3,500	Th \$4,000	
Earned Value (EV):	\$2,750	\$2,750	\$3,000		
Actual Costs (AC):	\$2,300	\$2,800	\$3,800		

SPI < 1.0 We are **(14%) BEHIND** schedule

E



CPI < 1.0

We are (21%) ABOVE cost

Charts and Graphs















Day 2 Charts





Day 3 Charts







Interpreting the graphs



Interpreting the graphs

Why do all the math?

It's important as a PM to be able to quantify how your projects are performing.

This becomes even more apparent when asking Sponsors, Program Managers or the Project Management Office for more resources (time, money or people).

	SPI	CPI
Cookies (After 1 hour)	0.75	0.83
Fence (After 3 days)	o.8 6	0.79

Use it to support the right efforts

If we have an organizational threshold of +/- 20% we now know what efforts best need our support (time, people or money)

Project	SPI	СРІ
Cookies	0.75	0.83
(After 1 hour)	(25% BEHIND)	(17% ABOVE)
Fence	0.86	0.79
(After 3 days)	(14% BEHIND)	(21% ABOVE)

But how long will it take (or cost) in real time?

Assuming the work will be performed at the same cumulative rate of progress, how much will the project eventually cost?



But how long will it take in real time?

Let's take a look at our two projects.



Estimate At Completion (EAC)

Estimate at Completion (EAC) for COST

EAC = BAC (cost) / CPI

Estimate at Completion (EAC) for TIME

EAC = BAC (time) / SPI
Let's look at the cookie project

Estimate at Completion (EAC) for COST

EAC = BAC (cost) / CPI

EAC = \$50 / .83

EAC = ??

Estimate at Completion (EAC) for TIME

EAC = BAC (time) / SPI

EAC = 5 hours / .75

EAC = ??

Let's look at the cookie project

Estimate at Completion (EAC) for COST

EAC = BAC (cost) / CPI

EAC = \$50 / .83

EAC = \$60.24

Estimate at Completion (EAC) for TIME

EAC = BAC (time) / SPI

EAC = 5 hours / .75

EAC = 6 hours and 40 minutes

And now the fence project

Estimate at Completion (EAC) for COST

EAC = BAC (cost) / CPI

EAC = \$4,000 / .86

EAC = ??

Estimate at Completion (EAC) for TIME

EAC = BAC (time) / SPI

EAC = 4 (days) / .79

EAC = ??

And now the fence project

Estimate at Completion (EAC) for COST

EAC = BAC (cost) / CPI

EAC = \$4,000 / .86

EAC = \$4,651

Estimate at Completion (EAC) for TIME

EAC = BAC (time) / SPI

EAC = 4 (days) / .79

EAC = 5.06 (days)

Our plans versus reality

Cookie Project

Plan: 5 hours and \$50

Projection: 6hrs 40 min and \$60.24

Fence Project

Plan: 4 days and \$4,000

Projection: 5+ days and \$4,651

Time or money?

What is our project constrained by?



Constraints are driven by RESOURCES

Project resources are the people, capital, time, and/or material goods required for the successful execution and completion of a project.



When does a task "earn" value?

When does a task "earn" value?

0/100 rule

All or nothing method to calculate EV A WBS task has no EV until it is complete Works best with highly detailed WBS



When does a task "earn" value?

Discrete Techniques: 0/50/100 rule 25/50/75/100 rule % complete Units complete



Understanding EVM

Know what constraints are alive and well in your projects and use EVM to protect the project against those constraints.

Understand the flaws in "snapshots" within your project.

Knowing how projects fall under programs and portfolios, EVM is a great tool allowing for concise reporting vs "storytelling"





Take-aways from EVM

- **EVM is a tool to report project** status effectively and in a manner understood by all
- Project reports (specifically
 budget and schedule) will allow you to get project support when needed.
- Knowing how your projects are actually performing is highly important to their success.

Questions?





