

Cost Monitoring and Control: EMV

Cost Monitoring and Control: Earned Value Management

An Example

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Presentation Summary

- A step-by-step walk-through of the Earned Value Management process
- Discuss what is required to support the implementation of Earned Value Management in an organization

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Cost Monitoring and Control: EMV

Features - 3 Variables

- PV - Planned Value
 - The value of the work that we plan to do
- EV - Earned Value
 - The value of the work that we have actually performed
- AC - Actual Cost
 - The actual cost of the resources that were required to undertake the work and, if the work package is complete, complete the work

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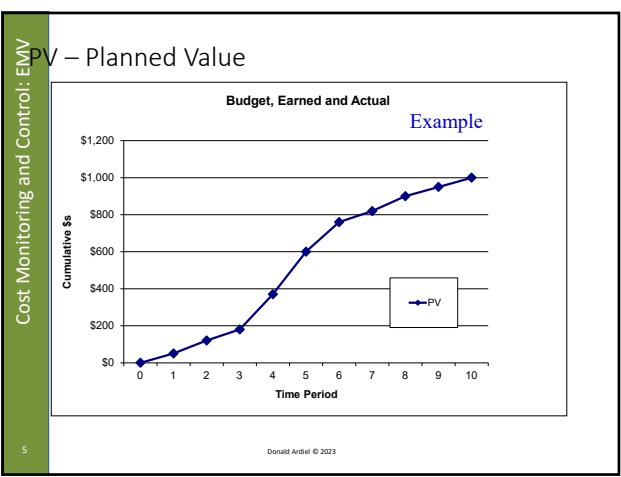
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The 3 Variables

- PV
 - Planned Value
 - The value of the work that we plan to do
 - Requires that we have:
 - Defined the scope of the work packages
 - Determined the resources required to do the work
 - Estimated the cost of those resources
 - Developed the critical path and project schedule
 - Established the budget baseline
 - Formerly called the "Budgeted Cost of the Work Scheduled" (BCWS)

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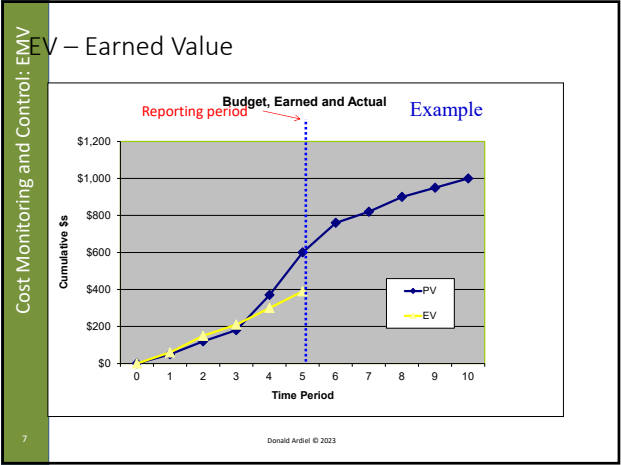


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The 3 Variables

- EV
 - Earned Value
 - The value of the work that we have actually performed
 - Requires that we have:
 - Know how much of the work of a work package has been performed and is that work completed
 - Know what work of a work package remains to be completed
 - How long uncompleted work of the package will take to complete
 - Formerly called the "Budgeted Cost of the Work Performed" (BCWP)

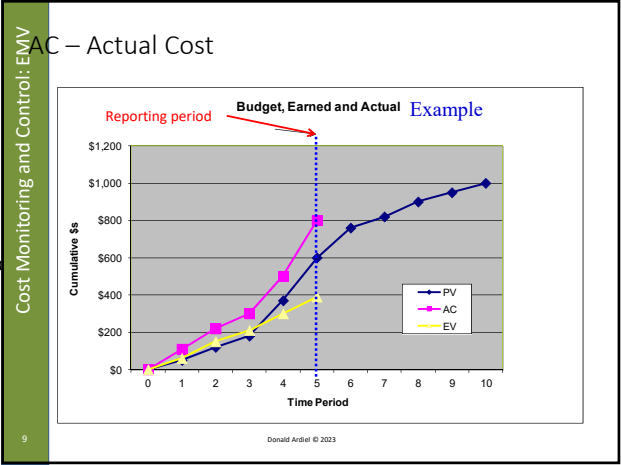
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The 3 Variables

- AC
 - Actual Cost
 - The actual cost of the resources that were required to undertake the work and, if the work package is complete, complete the work.
 - Requires that we have:
 - Know the cost of the resources that expended effort in doing the work and the cost of purchased goods and services required to complete the work
 - Formerly called the "Actual Cost of the Work Performed" (ACWP)



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Performance Information Gathering and Processing System

- Project Information Management System
 - Work package-based performance reporting system
 - Timely Information gathering, processing and reporting
 - Requires the discipline of all project resources to log their work routinely

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Calculating EV

- EV
 - Combination of work done, work remaining and judgment of whether work performance (outcome) is/has achieved expectations (quality)

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Calculating EV Specific Deliverable:

1. PV:
 - \$10,000
 - 10 weeks
 - 10 widgets
2. Progress:
 - 4 widgets
 - 5 weeks
3. $EV = 4 \text{ widgets} * \$1,000 \text{ per widget} = \$4,000$

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Calculating EV

Percentage Complete:

- Ask those doing the work for the % of completion
 - Not accurate: estimate usually larger than actual
- Progressively more difficult to estimate completion as end of task approaches
- Last 20 % of activity takes 80% of the time
- Example:
 - 75% completed widgets
 - $EV = 75\% * \$10,000 = \$7,500$

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Calculating EV

0 – 100% Rule

- Task is either 0 or 100% complete
- Easy accounting
- Difficult to judge progress until total completion of task
- Alleviates the 20%/80% rule
- Example:
 - 4 widgets of 10 completed
 - $EV = 0\% * \$10,000 = \0

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Calculating EV

50-50% Rule

- At beginning of task, 50% of the work deemed complete
- At completion of task, remaining 50% deemed completed
- Does not give indication of progress
- Example:
 - 1 widgets of 10 completed
 - $EV = 50\% * \$10,000 = \$5,000$

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Calculating EV Time Remaining

- Ask those performing work how much time remains to complete the task
- Subtract from baseline amount
- $EV = (1 - Remaining / (Remaining + AC))$

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Calculating EV – Time Remaining

- Example:
 - PV = \$5,000
 - Widget task = 50 man-hours @ \$100/hr.
 - AC = \$3,000
 - 25 man-hours remaining
 - EV = $(1 - (\$2,500 / (\$2,500 + \$3,000))) * \$5,000$
 = $(1 - 0.45) * \$5,000$
 = \$2,750

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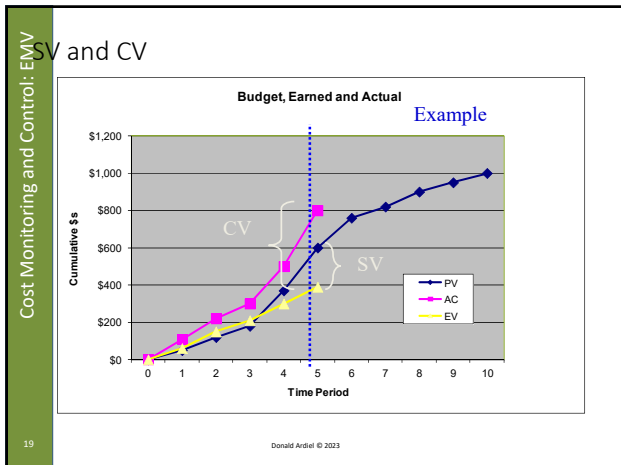
The Variances

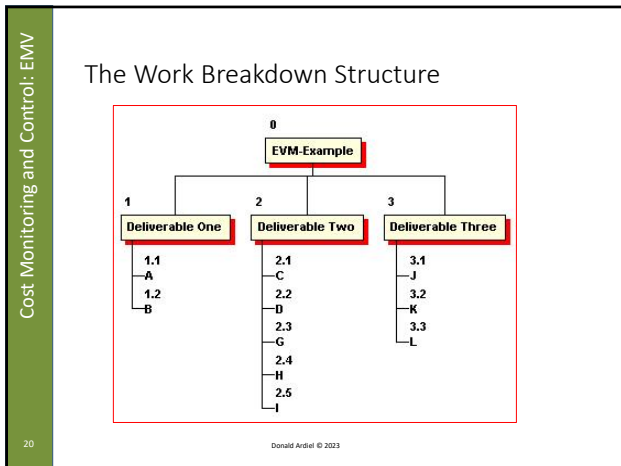
- SV
 - Schedule Variance
 - The difference between the PV and the EV
 - $EV - PV = SV$
- CV
 - Cost Variance
 - The Difference between the PN and the AC
 - $EV - AC = CV$

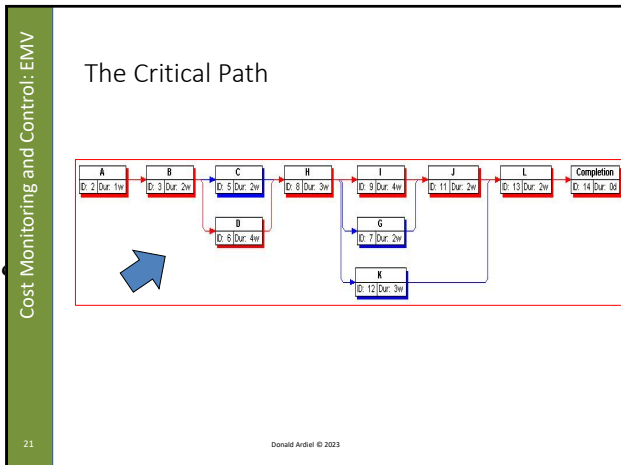
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Estimating Resource Costs

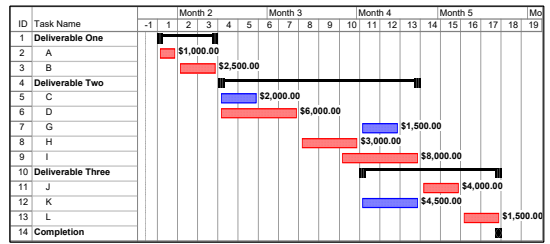
Earned Value Management Example WBS and Cost Estimation

WBS Package Name	Department 'Q' Resources			Department 'R' Resources			Department 'S' Resources			Purchased Goods and Services	Total Work Package Cost	
	Q1	Q2	Q3	R1	R2	R3	S1	S2	S3			
Deliverable One												
1.1 Package A	250	350		250						150	1000	
1.2 Package B	800			700							1000	2500
Deliverable Two												
2.1 Package C	1000											2000
2.2 Package D		1000	2000	1000	1000	1000				1000	6000	
2.3 Package G	1000			500	250	250					2000	
2.4 Package H				500	3000	500	2000				6000	
2.5 Package I				2000	3000	1000				2000	8000	
Deliverable Three												
3.1 Package J							2000	2000				4000
3.2 Package K	1000						1500	2000				4500
3.3 Package L									750	750	1500	
Total Resource Cost	2250	1150	3700	2500	750	6250	4500	6750	5750	3900	37500	

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The Gantt Chart



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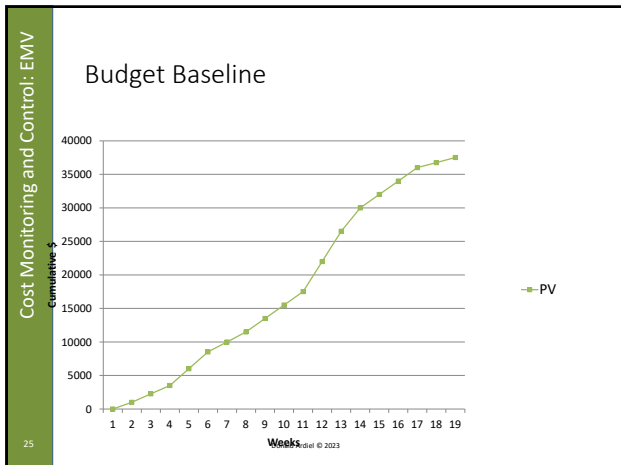
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The Planned Value

Task	Weeks																		Estimated Work Package Cost
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
A	1000																		1000
B		1250	1250																2500
C			1000	1000															2000
D			1500	1500	1500														4500
E					2000	2000	2000												6000
F							2000	2000	2000	2000								8000	
G								1500	1500	1500							4500		
H											750	750						1500	
PV over week	1000	1250	1750	2500	3500	4500	6500	8500	10000	12000	14000	16000	18000	20000	20000	20000	20000	20000	37500
PV	1250	2500	3750	5000	6250	7500	8750	10000	11250	12500	13750	15000	16250	17500	18750	20000	21250	22500	23750

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9th week Reporting Period

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Work Package PA	Work Package PB
A	1000																		1000	
B		1750	1750																	2000
C				1000	1000															2000
D						1000	1000													2000
E								1000	1000											2000
F										2000	2000									4000
G												2000	2000							4000
H														2000	2000					4000
I																2000	2000			4000
J																		2000		2000
K																			2000	2000
L																				2000
M																				
N																				
O																				
PV per week	1000	1750	1750	2750	2750	3750	3750	4750	4750	5750	5750	6750	6750	7750	7750	8750	8750	9750	9750	10750
AC per week	1000	2000	2000	3000	3000	4000	4000	5000	5000	6000	6000	7000	7000	8000	8000	9000	9000	10000	10000	11000
EV per week	1000	1750	1750	2750	2750	3750	3750	4750	4750	5750	5750	6750	6750	7750	7750	8750	8750	9750	9750	10750
PA	1000	2750	2750	3750	3750	4750	4750	5750	5750	6750	6750	7750	7750	8750	8750	9750	9750	10750	10750	11750

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Variances – At Week 9

- PV = 15,500
- AC = 20,750
- EV = 17,500

• Schedule Variance = $EV - PV$
 $= 17,500 - 15,500$
 $= \$2,000$

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Variations – At Week 9

- PV = 15,500
- AC= 20,750
- EV= 17,500

- Cost Variance = EV- AC
- = 17,500 – 20,750
- = - \$ 3,250

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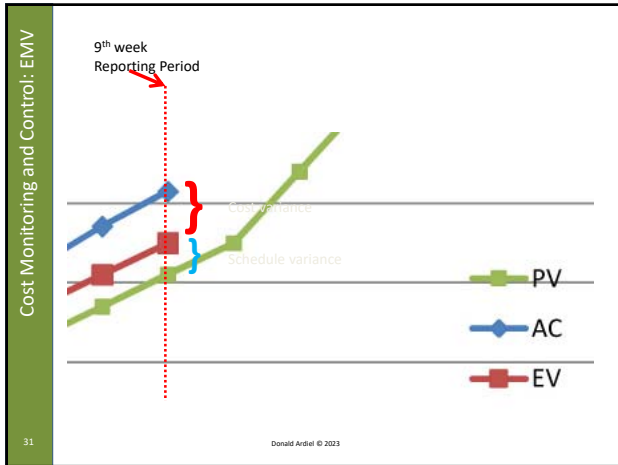
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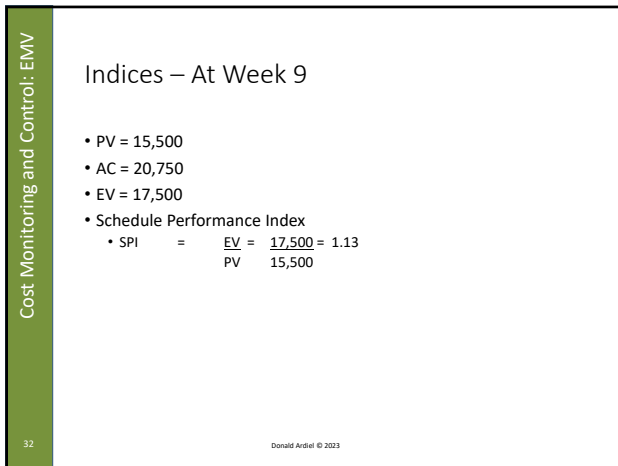
9th week Reporting Period

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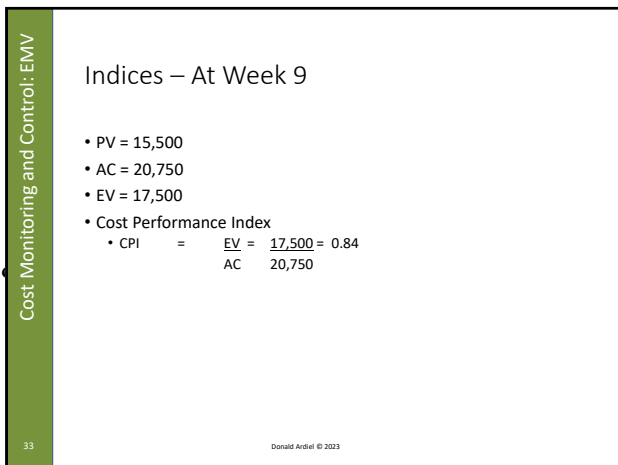
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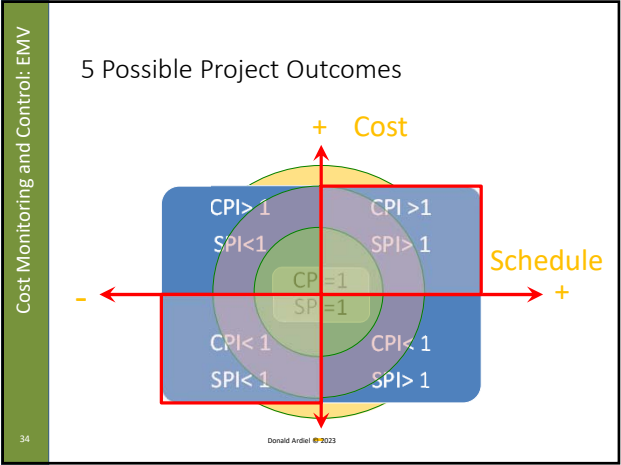
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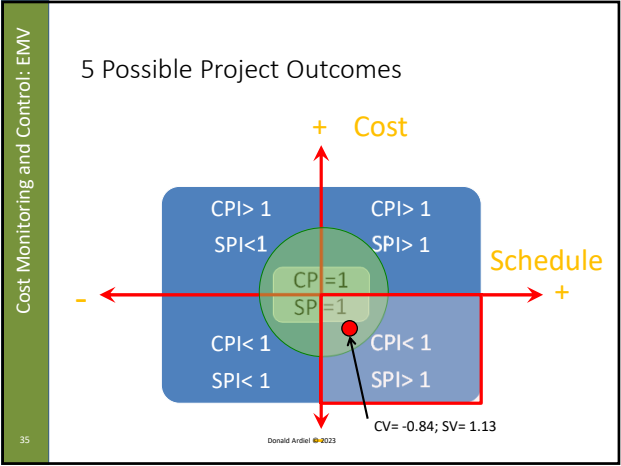
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Future Cost Calculations

- Takes the cost up to now and applies a performance factor (PF) against remaining budgeted work
- Assumes performance remains constant

$$EAC = AC + (BAC - EV) / PF$$

EAC – Estimated at completion
 ETC – Estimated to Complete
 BAC – Budgeted at completion – the cumulative PV
 PF – Performance factor

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Future Cost Calculations

- The PF may be any of the following:
 - cumulative CPI
 - Most recent 6 month CPI
 - cumulative SPI
 - Most recent 6 month SPI
 - (0.2 * SPI + 0.8* CPI)
 - Other combination

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Constant Cost Efficiency: Cost

- ETC = $(BAC - EV) / CPI$
 = $(37,500 - 17,500) / 0.84$
 = \$23,810
- EAC = ETC + AC
 = 23,810 + 20,750
 = \$44,560
- Estimated to Complete = ETC

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Constant Cost Efficiency: Schedule

- ETC = $(BAC - EV) / SPI$
 = $(37,500 - 17,500) / 1.13$
 = \$17,700
- EAC = ETC + AC
 = 17,700 + 20,750
 = \$38,450

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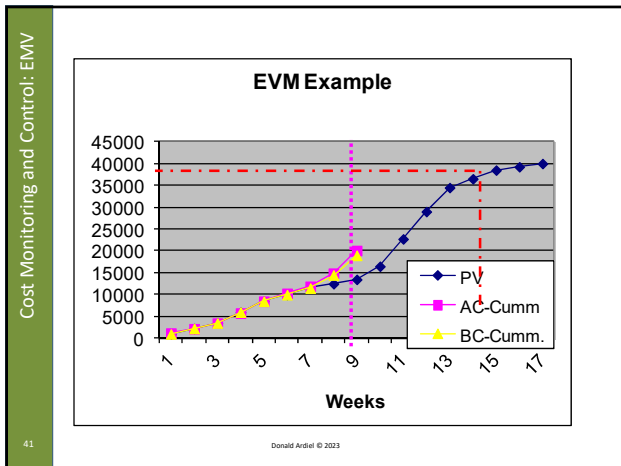
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Constant Cost Efficiency: Schedule

- This suggests that the project will finish slightly over budget ~ \$1,000 and 2 ½ weeks ahead of schedule.

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Constant Cost Efficiency

- Future Cost Calculation:
 - performance factor = $(0.2 * SPI + 0.8 * CPI)$
 - EAC = $AC + (BAC - EV) / (0.2 * SPI + 0.8 * CPI)$
 - $= 20,750 + (37,500 - 17,500) / (0.23 + 0.67)$
 - $= 20,750 + (20,000 / 0.9)$
 - $= 20,750 + 22,220$
 - $= 42,970$
- Original budget: \$37,500
- Projected cost overrun: \$5,470
- The project is project to finish 2 weeks ahead of schedule.

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EVM and Project Decision Support

Reduce Costs – Lengthen project


- Identify tasks in the critical path where experienced and more expensive resources could be replaced with less expensive juniors

Maintain current schedule – accept costs

- Stay the course and accept the additional costs



RISK

Higher  Lower

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Presentation Summary

- A step-by-step walk-through of the Earned Value Management process
- Discuss what is required to support the implementation of Earned Value Management in an organization

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