IIT ROORKEE

NPTEL ONLINE CERTIFICATION COURSE

Project Management for Managers

Lec – 53

Cost Control Tools and Techniques

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Cost Control: Tools and Techniques

2. Performance Measurement Analysis: Performance measurement techniques help to assess the **magnitude of any variances** that will invariably occur.

The earned value technique (EVT) compares the value of the **budgeted cost of work performed** (earned) at the original allocated budget amount to both the **budgeted cost of work scheduled** (planned) and to the **actual cost of work performed** (actual). This technique is especially useful for cost control, resource management, and production.

An **important part of cost control is to determine** the **cause of a variance**, the **magnitude** of the variance, and to decide if the variance **requires corrective action.**

The earned value technique involves developing these key values for each schedule activity, work package, or control account:

- **Planned value (PV):** PV is the **budgeted cost for the work scheduled to be completed** on an activity or WBS component.
- **Earned value (EV):** EV is the **budgeted amount for the work actually completed** on the schedule activity or WBS component.

•**Actual cost (AC):** AC is the **total cost incurred** in accomplishing work on the schedule activity or WBS component. This AC must correspond in definition and coverage to whatever was budgeted for the PV and the EV (e.g., direct hours only, direct costs only, or all costs including indirect costs).

•**Budgeted cost at completion (BAC):** This represents the total budget for a project.

The **PV, EV, and AC** values are used in **combination to provide performance measures** of whether or not work is being **accomplished** as **planned** at any given point in time.

The most commonly used measures are **cost variance (CV) and schedule variance (SV).**

Cost variance (CV): CV equals earned value (EV) minus actual cost (AC). The cost variance at the end of the project will be the **difference between the budget at completion (BAC) and the actual amount spent.**

Formula: CV= EV – AC

• **Schedule variance (SV): SV equals earned value (EV) minus planned value (PV).** Schedule variance **will ultimately equal zero when the project is completed because all of the planned values will have been earned.**

Formula: SV = EV – PV

These two values, the CV and SV, can be **converted to efficiency indicators** to **reflect the cost and schedule performance of any project.**

Cost performance index (CPI): A CPI value less than 1.0 indicates a cost overrun of the estimates. A CPI value greater than 1.0 indicates a **cost underrun** of the estimates.

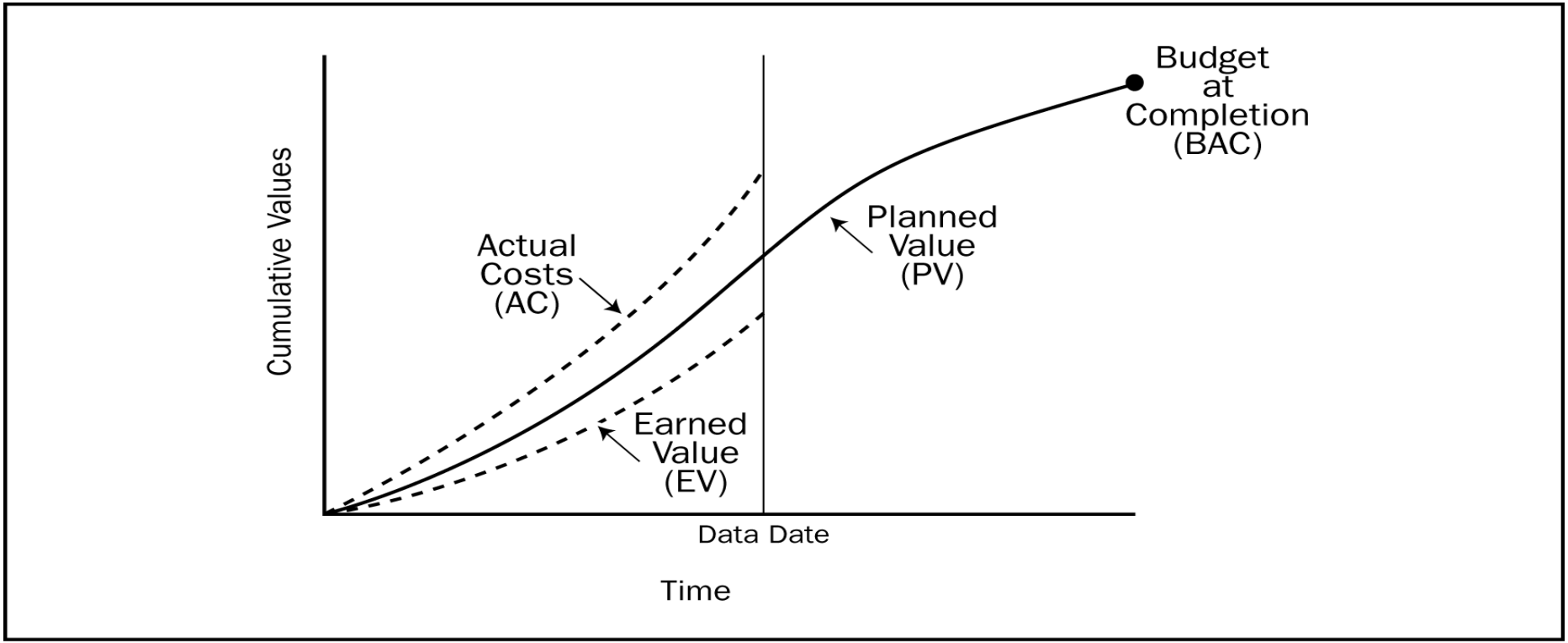
The CPI is the most **commonly used cost-efficiency indicator**.

Formula: **CPI = EV/AC**

Schedule performance index (SPI): The SPI is used, in addition to the schedule status, **to predict the completion date** and **is sometimes used in conjunction with the CPI to forecast the project completion estimates**.

Formula: **SPI = EV/PV**

Figure uses S-curves to display EV data for a project that is over budget and behind the work plan.



Cost Control: Tools and Techniques

3.Forecasting: Forecasting includes **making estimates or predictions of conditions in the project's future based on information** and knowledge available at the time of the forecast.

4.Project Performance Reviews: Performance reviews **compare cost performance over time, schedule activities or work packages overrunning and under running budget** (planned value), **milestones due, and milestones met**.

5. Project Management Software: Project management software, **such as computerized spreadsheets, is often used to monitor PV versus AC,** and to forecast the effects of changes or variances.

6. Variance Management: The cost management plan describes **how cost variances will be managed, for example, having different responses to major or minor problems**. The amount of variance tends to **decrease as more work is accomplished**.

Cost Control: Outputs

1 Cost Estimates (Updates)

2 Cost Baseline (Updates)

3 Performance Measurements

4 Forecasted Completion

5 Requested Changes

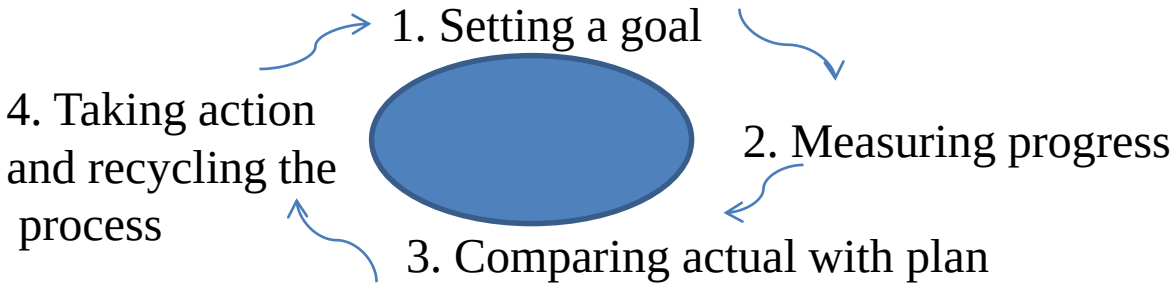
6 Recommended Corrective Actions

7 Organizational Process Assets (Updates)

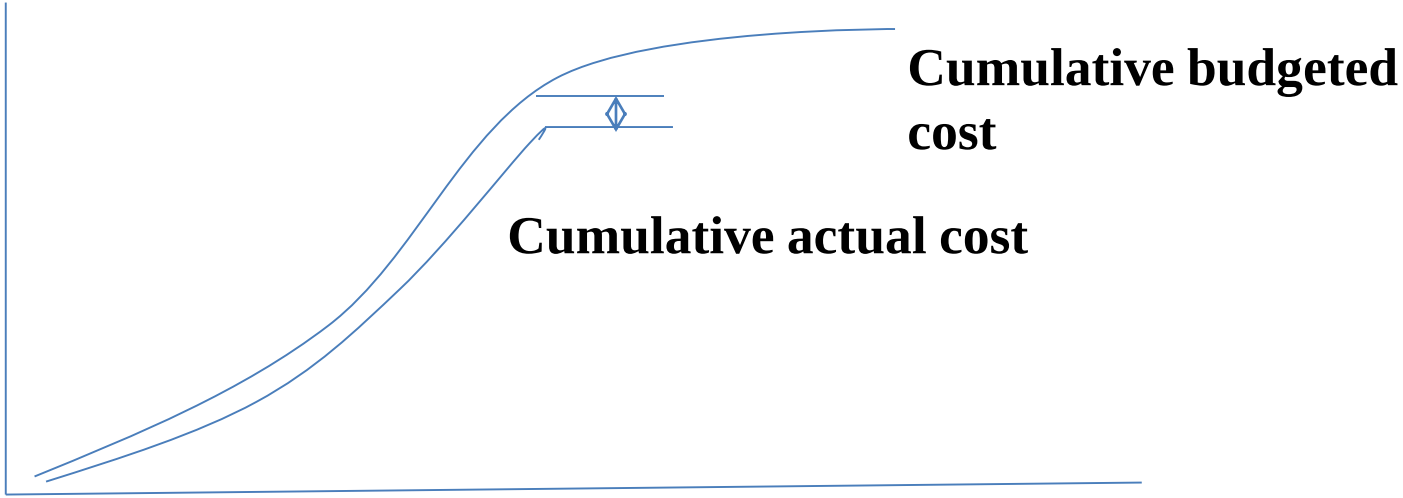
8 Project Management Plan (Updates)

For project control: What information concerning the project should be measured, and when are the best times to measure it.

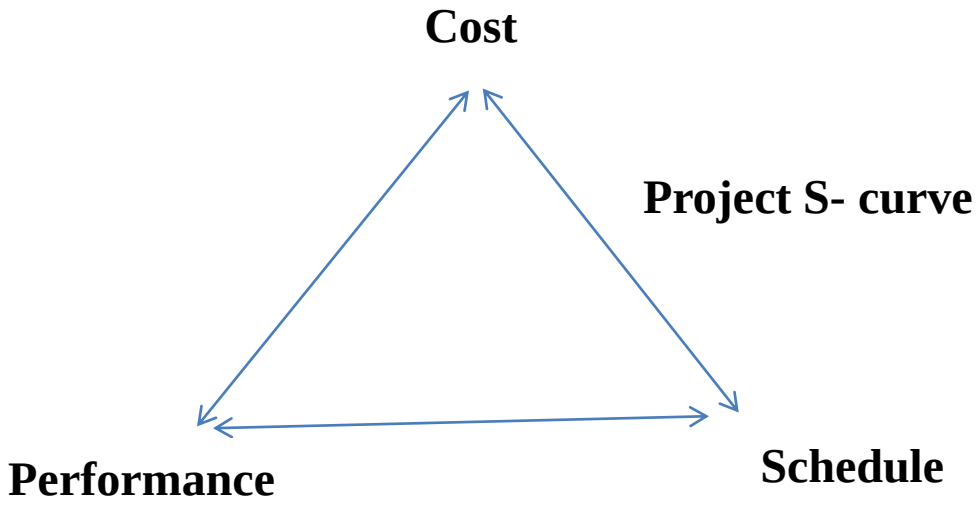
Project Control Cycle : A general model



The project S curve:



S- curve drawback : It does not give cause of variance.



Monitoring Project Performance

Another method of monitoring project progress **is millstone analysis**. **A milestone is an event or stage of the project that represents a significant accomplishment** on the road to the project's completion.

Completion of a deliverable, an **important activity on** the project's critical path, or even a **calendar date** can all be milestones.

They are reactive control system.

The tracking Gantt Chart: Future **projection of project's status** and **reasons of delay are not known** are the drawbacks of this method.

Earned Value Management: Unlike previous project tracking approaches **, EVM recognizes that it is necessary to jointly consider the impact of time, cost,** and **project performance** on any analysis of current project status.

Put another way: Any monitoring system that **only compares actual against budget cost numbers** ignores the fact that the client is spending that money to accomplish something –create a project. Therefore, EVM reintroduces and stresses the importance of **analyzing the time element** in the project status updates.

EVM also allows the project team to **make future projections of the project status** based on its current status.

Earned value, directly links **all three project success matrices** (cost, schedule, and performance)

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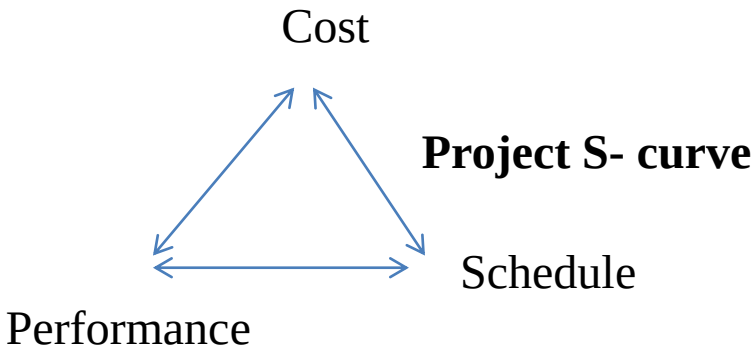
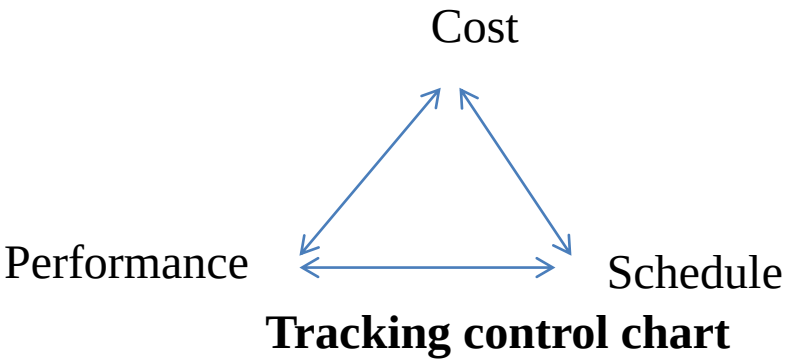
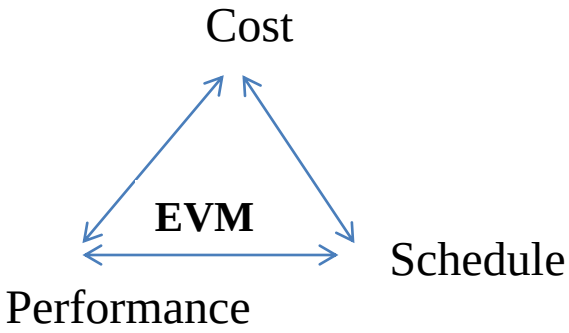
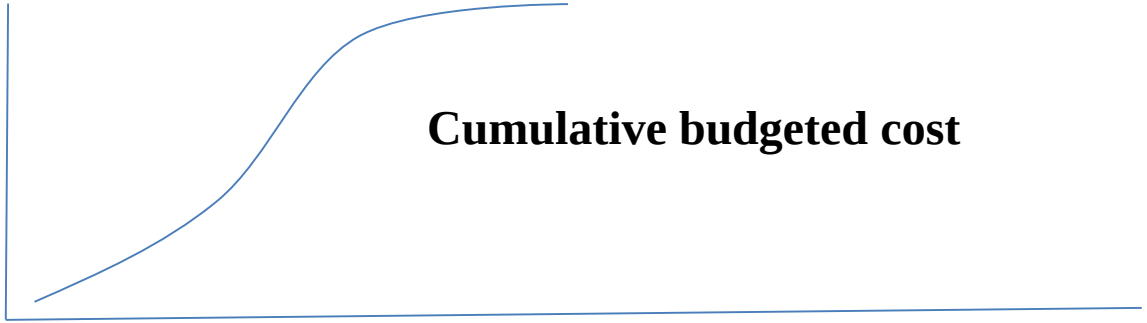






Budgeted cost for a project

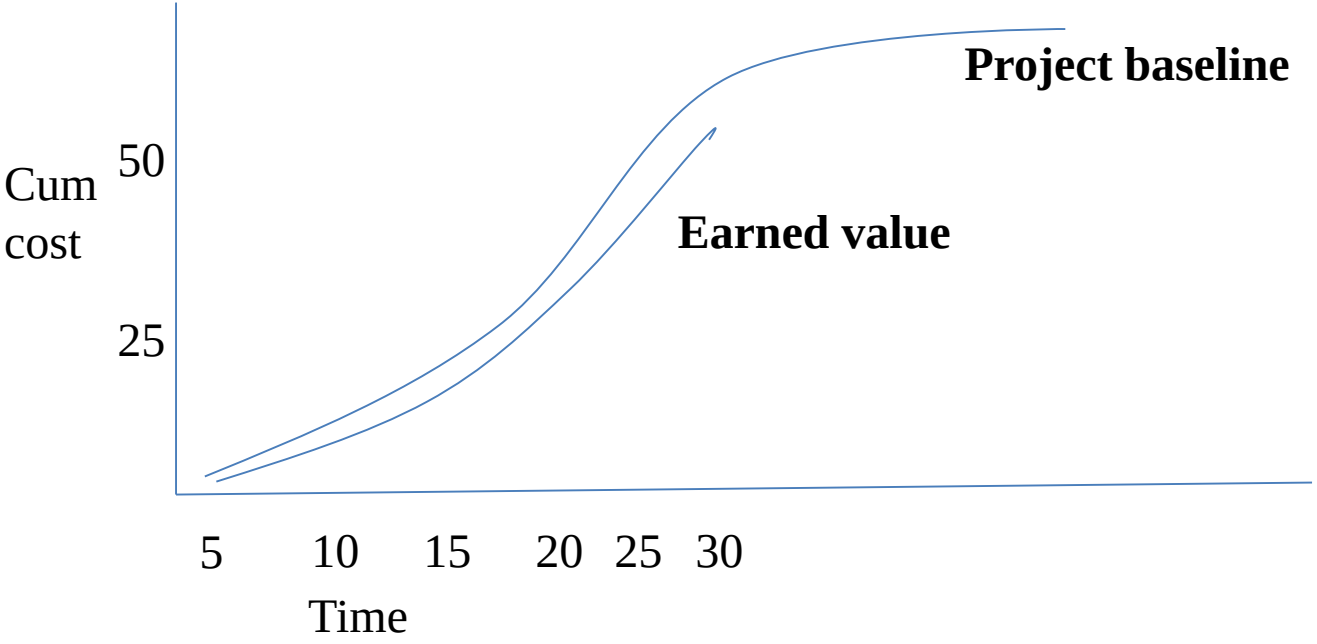
Duration (in weeks)									
	5	10	15	20	25	30	35	40	45
Design	6	2							
Engineering		4	8	8	8				
Installation				4	20	6			
Testing						2	6	4	2
Total	6	6	8	12	28	8	6	4	2
Cumulative	6	12	20	32	60	68	74	78	80



Percentage of tasks completed for above project: Suppose that on 30th week, design and engineering are 100% complete and installation is 50% complete.

Duration (in weeks)										
	5	10	15	20	25	**30**	35	40	45	% completed
Design	6	2								100
Engineering		4	8	8	8					100
Installation				4	20	**6**				50
Testing						**2**	6	4	2	0
Total	6	6	8	12	28	**8**	6	4	2	
Cumulative	6	12	20	32	60	**68**	74	78	80	

Duration (in weeks)			
	Planned	% complete	Earned value
Design	8	100	8
Engineering	28	100	28
Installation	30	50	15
Testing	14	0	0
Cumulative Earned value			51


Project baseline
Earned value
Cum cost
50
25
5
10
15
20
25
30
Time

The project has 8 months schedule and 118 budget. Calculate earned value at the end of June?.

Duration (in weeks)										
	Jan	Feb	Mar	Apr	May	**June**	July	**Plan**	**% Completed**	**Value**
Staffing	8	7						15	100	
Blueprint			4	6				10	80	
Prototype			2	8				10	60	
Full design				3	8	**10**		21	33	
Construction					2	**30**		32	25	
Transfer							10	10	0	
Punch list						**15**	5	20	0	
								∑ 118		
Monthly plan	8	7	6	17	10	**55**	15			
Monthly actual	8	11	8	11	10	**30**	0			

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Blueprint			4	6				10	80	8
Prototype			2	8				10	60	6
Full design				3	8	**10**		21	33	7
Construction					2	**30**		32	25	8
Transfer							10	10	0	0
Punch list						**15**	5	20	0	0
								∑ 118		**44**
Monthly plan	8	7	6	17	10	**55**	15			
Cumulative	8	15	21	38	48	**103**	118			
Monthly actual	8	11	8	11	10	**30**	0			
Cumulative actual	8	19	27	38	48	**78**				

Total planned budget is 118 and the value realized is 44.

Schedule variances	
Planned value (PV)	103
Earned value(EV)	44
Schedule performance index (SPI)	EV/PV =.43
Estimated time to completion	1/ (.43) * (8)=**18.60,** We are running 10 months behind schedule

Cost variances	
Actual cost of work performed (AC)	78
Earned value (EV)	44
Cost performance index (CPI)	EV/AC = .56
Estimated cost to completion	1/(.56) * 118=210