# Software Project Management

Week 12

## Today's Lecture

- Developing Work-breakdown structure
- Estimating size of a software
- Developing Budgets and Schedules
- Project Controlling against Schedules

**Slides are derived from Mr. Suhail Iqbal Slides**

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## Project Management Plan – Ingredients of our interest

- **Schedule Management Plan**
- **Staffing Management Plan**
- **Risk Register**
- **Schedule**
- **Budget**

# Establishing Control Accounts

- **Control account** – Level of the WBS at which a budget is assigned and a *control account manager (CAM)* is given responsibility for delivering the item
- Create control accounts at the level that senior management wants to track cost and schedule
- Use the responsibility assignment matrix (RAM) as a tool

## Responsibility Assignment Matrix

- **RAM –** The integration of the WBS and the OBS of a project
- Proper creation of the RAM results from locating the intersection of the OBS unit that is assigned responsibility for the work and the specific WBS element that defines the work to be performed

## EV Terms

| *Data Elemen* | *Term* | *Acronym* |
|---|---|---|
| Scheduled Work | Budgeted Cost of Work Scheduled | PV |
| Earned Value | Budgeted Cost of Work Performed | EV |
| Actuals | Actual Cost of Work Performed | AC |
| Authorized Work | Budget at Completion | BAC |
| Forecasted Cost | Estimate at Completion | EAC |
| Work Variance | Schedule Variance | SV |
| Cost Variance | Cost Variance | CV |
| Completion Varia | Variance at Completion | VAC |

## Earned Value Technique
## PV, EV & AC

- **Planned value (PV).** PV is the budgeted cost for the work scheduled to be completed on an activity or WBS component up to a given point in time.
- **Earned value (EV).** EV is the budgeted amount for the work actually completed on the schedule activity or WBS component during a given time period.
- **Actual cost (AC).** AC is the total cost incurred in accomplishing work on the schedule activity or WBS component during a given time period.

## Earned Value Technique
## ETC

- **Estimate to complete (ETC) and estimate at completion (EAC).**
  - 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).
  - The amount of variance of the CV and SV values tend to decrease as the project reaches completion due to the compensating effect of more work being accomplished.
  - Predetermined acceptable variance values that will decrease over time as the project progresses towards completion can be established in the cost management plan.

## Earned Value Technique CV & 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.

## Earned Value Technique CPI, CPIC & SPI

- **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 under-run of the estimates. CPI equals the ratio of the EV to the AC. The CPI is the most commonly used cost-efficiency indicator.
- Formula: CPI = EV/AC or BCWP/ACWP
- **Cumulative CPI (CPIC).** The cumulative CPI is widely used to forecast project costs at completion**.** CPIC equals the sum of the periodic earned values (EVC) divided by the sum of the individual actual costs (ACC).
- Formula: CPIC = EVC/ACC
- **Schedule performance index (SPI).** The SPI is used, in addition to the schedule status (Section 6.6.2.1), to predict the completion date and is sometimes used in conjunction with the CPI to forecast the project completion estimates. SPI equals the ratio of the EV to the PV.
- Formula: SPI = EV/PV or BCWP/BCWS

## Control Account Example

**CA #1**

- WBS Element: 1.1 Frame
- OBS Element: Frame Shop
- CAM: Mr. I. M. Smart
- Budget: $ 125,000
- Schedule: Jan - Jun 00

## Control Account Managers

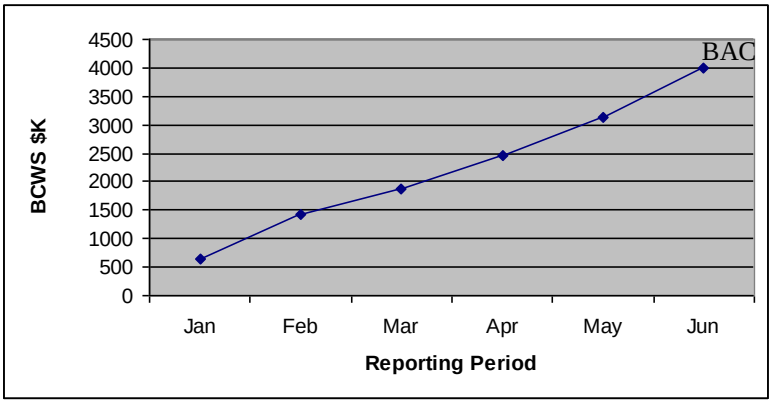
- Receive work authorization
- Develop work and planning packages
- Assign a budget and schedule for each work and planning package
- Build a baseline by summing the *budgeted cost of work scheduled (BCWS)* for each reporting period

# Performance Measurement Baseline (PMB)

- The *plan* against which *actual* performance can be compared
- Based on budgets assigned to scheduled segments of work
- Build PMB by summing the BCWS for all control accounts, by reporting period
- **Budget at completion (BAC)** – Equal to the cumulative BCWS for the total project

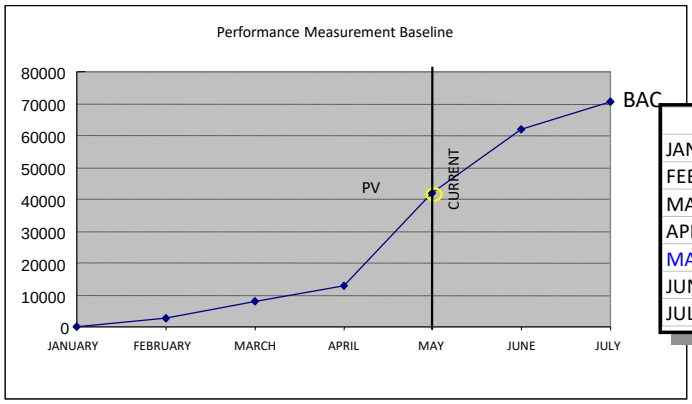
# Performance Measurement Baseline (PMB)

Time-Phased Budget



# Budgeted Cost of Work Scheduled (PV)

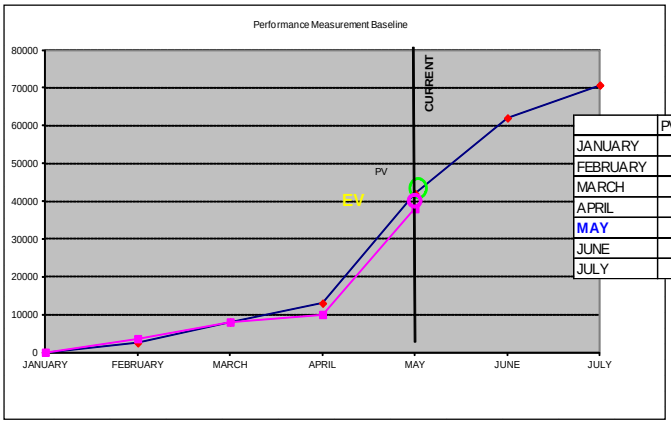
Work schedule to be accomplished




| | PV |
|---|---|
| JANUARY | 0 |
| FEBRUARY | 2500 |
| MARCH | 8000 |
| APRIL | 13000 |
| MAY | 42000 |
| JUNE | 62000 |
| JULY | 70700 |

# Budgeted Cost of Work Performed (EV)

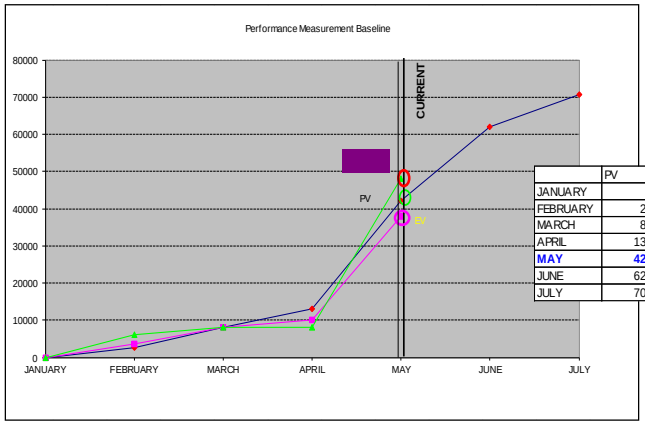
Budgeted value of completed or in-process work




| | PV | EV |
|---|---|---|
| JANUARY | 0 | 0 |
| FEBRUARY | 2500 | 3600 |
| MARCH | 8000 | 8000 |
| APRIL | 13000 | 10000 |
| MAY | 42000 | 38000 |
| JUNE | 62000 | |
| JULY | 70700 | |

# Actual Cost of Work Performed (AC)

Actual value of completed or in-process work




| | PV | EV | AC |
|---|---|---|---|
| JANUARY | 0 | 0 | 0 |
| FEBRUARY | 2500 | 3600 | 6000 |
| MARCH | 8000 | 8000 | 8000 |
| APRIL | 13000 | 10000 | 8000 |
| MAY | 42000 | 38000 | 48000 |
| JUNE | 62000 | | |
| JULY | 70700 | | |

# SV Example

- **PV = $42,000**
- **EV = $38,000**
- **AC = $48,000**
- **SV = EV – PV**
  **= $38,000 – $42,000 = - $4,000**
- **SV% = SV / PV**
  **= - $4000 / $42,000 = - 0.095**
  **= - 9.5%**

- **Cost Variance Example**
  - **PV = $42,000**
  - **EV = $38,000**
  - **AC = $48,000**
  - **CV = EV - AC**
    **= $38,000 – $48,000 = - $10,000**
  - **CV% = CV / EV**
    **= - $10,000 / $38,000**
    **= - 26%**

## CPI Example

- **PV = $42,000**
- **EV = $38,000**
- **AC = $48,000**
- **CPI = EV / AC**
  **= $38,000 / $48,000 = 0.79**
- **$0.79** worth of work was actually done for each **$1.00** spent

## SPI Example

- **PV = $42,000**
- **EV = $38,000**
- **AC = $48,000**
- **SPI = EV / PV**
  **= $38,000 / $42,000 = 0.90**
- **$0.90** worth of work *has been done* for each **$1.00** worth of work *that was planned to be done*

## EAC Example

One methodology (when no other CPI is avail):

- **EAC = BAC / CPI**
- **BAC = $80,000**
- **CPI = 0.79**
- **EAC = $80,000 / 0.79 = $101,265**

## Variance at Completion

- **BAC = $80,000**
- **EAC = $101,265**
- **VAC = BAC – EAC**
  **= $80,000 – $101,265**
  **= -$21,265**
- Based on past performance, project will *exceed* planned budget by $21,265

## To Complete Performance Index (TCPI)

- Work Remaining / Cost Remaining
- **TCPI = (BAC – EV) / (EAC – AC)**

**= ($ 80,000 – $ 38,000) / ($ 101,265 – $48,000)**

**= $ 42,000 / $ 53,265**

**= 0.7885**