

Simple Earned Value

1. Earned Value basics

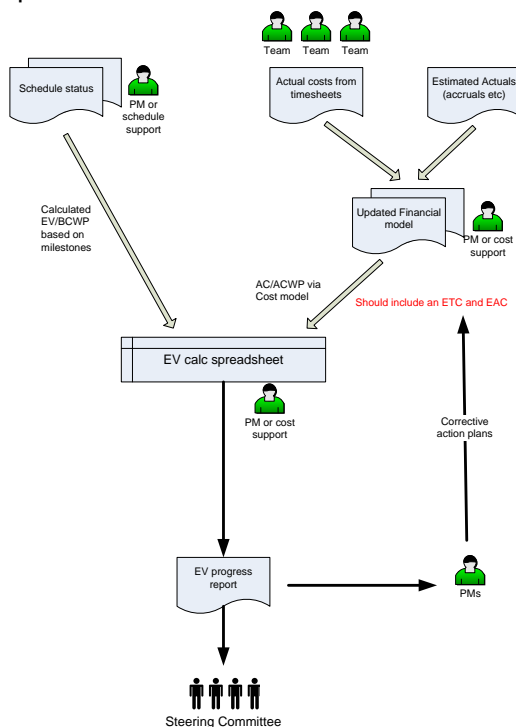
This document outlines a "Simple Earned Value" technique, a technique which sticks to a simple 0/100% Milestone approach with some Level of effort tasks maintained using % Complete. Note in MS Project % Complete is % of duration complete.

Earned Value provides a third dimension to cost reporting. Most financial project reporting provides budget vs actual costs. Some systems time phase the budget to provide budget vs actual costs at a point in time. Earned Value provides a third element so that a determination of schedule performance can be made (compare planned with earned) and a determination of cost performance can be made (compare actual with earned). Earned Value also provides the ability to validate Estimate at Completion (forecast cost) so a comparison against Budget at Completion can be predicted.

To undertake Earned value measurement you require:

- A time phased budget (which is maintained) with budgets set against work packages
- Recording of actual costs against work packages
- Recording of Earned Value against the same work packages and in the same reporting period as the actuals are collected
- A way of measuring Earned value against a work package (Earned Value Technique, in this case mainly 0/100%)

Note for the purposes of this document, a work package can be considered as a discrete WBS scope piece.



The diagram above shows information flow in a typical EVM System using MS Project.

2. Establishing the Baseline – the Planned Value (PV)

2.1 Status date

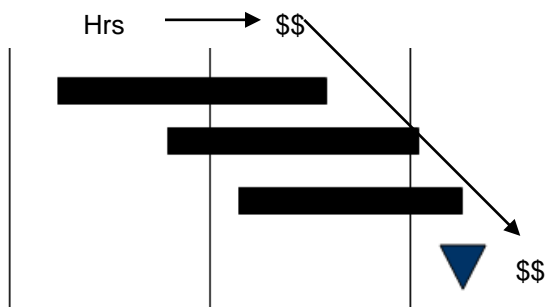
A key to the replan will be the "Status date", considered 5pm. At this point the Program would close off capturing of actual costs and schedule status against preliminary pre planning work packages. Effectively up to this date the Actuals, Planned and Performed will be set to the same figures (being the Actuals). These will typically roll up to a control account called "Pre-replan". All planning and estimating will focus on post "Status date" activity, this will be the focus of the new Baseline.

2.2 Scheduling

Detailed schedules will be created for each WBS element, these are typically built and refined progressively over a number of weeks. The detailed schedules will need to be mapped to the Work packages via coding fields. As per normal practice, dependencies and durations will need to be reviewed to ensure date consistency. The schedule will be statused up to the "Status date" and Baselined from a date perspective once the schedule is agreed or signed off. From that point on statusing will be on a defined basis as per typical scheduling standards. If baseline agreement is prolonged a second copy of the schedule may be needed for statusing and forecasting purposes and then Baseline and Forecast files combined using the data Import/Export mapping techniques shown elsewhere in this document.

2.3 Determining dollar spread

Dollar spreading inside MS Project is often the most difficult and time consuming component. You need a basis for spreading dollars. Rarely will MS Project tasks align with budgets, more often than not you will have manhours for major elements. One technique involves spreading based on a weighted system of manhours for the detailed tasks, this works quite well. The heart of the simple Earned Value technique is using a "Lump sum" dollar only allocation to milestones. There should ideally be a milestone per reporting period.



2.4 Allocating dollars to Tasks

If using a Milestone based Simple Earned Value approach, the only time you will need to allocate dollars to tasks will be for "level of effort" tasks such as Project Management. To assign Fixed costs to tasks (as per Session 2):

1. Set up a new resource, eg "Lump Sum"
2. Change **Type** to **Material**.
3. Add a **Material Label** "Dollar" (or multiple eg \$K)
4. Under the **Costs** tab set **Standard rate** to \$1 per unit
5. Assign as many units to a task as the dollar amount, eg 1000 units will equal \$1000 in this example

Task Name	Duration	Cost	Start	Finish	Predecessors
task	10 days	\$2,000.00	22/03/07	4/04/07	
task 2	10 days	\$1,000.00	22/03/07	4/04/07	

2.5 Allocating dollars to Milestones

To assign Fixed costs to Milestones:

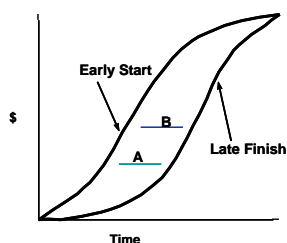
1. Set up a new resource as per the above, you could reuse the "Lump Sum" if you want.
2. Assign the Resource to milestone (will default to 0 units)
3. Use **Window, Split** to show **Task Form** at the bottom and **Format, Details** to show **Resource Costs**
4. Change the dollar figure in the Task Form to the desired value, (remember you may need to click OK when using task form).

Task Name	Duration	Cost	Start	Finish	Predecessors
task	10 days	\$2,000.00	22/03/07	4/04/07	
task 2	10 days	\$1,000.00	22/03/07	4/04/07	
Milestone	0 days	\$1,000.00	22/03/07	22/03/07	

Hint: Add the Costs column to the table section of the Gantt Chart to see the costs accrue. Never use the column "Fixed Costs".

2.6 Extracting Planned value (Time phased budget)

The Simple Earned Value technique ignores complexity associated with Early vs Late forecasts. A Schedule could follow the Late curve and still be considered on schedule. Time phased budgets are calculated in MS Project using the Early dates. If users want they should temporarily set all **As Soon as Possible** tasks to **As Late As Possible** before extracting Planned value figures.



To extract the Time phased budget:

1. Change view to **Resource Usage**
2. Add **Cost** column to table if not already there
3. Adjust **Timescale** as need be, typically monthly, weekly or fortnightly
4. **Format, Detail Styles** to show **Cost**
5. **Copy** and **Paste** data to Excel. Note you will need to manually enter the timescale and separately copy the left and right hand sides of the vertical screen divider. Alternatively consider using **Data Mapping** or **Analysis toolbar** functions.
6. Tidy up as need be in Excel (eg separate incremental and cumulative data, prepare graphs etc) and save Excel file.

1	Resource Name	Cost	Details	May '09							Jun '09		
				13	20	27	4	11	18	25	1	8	15
	Fixed cost	\$85,000.00	Cost	\$5,400.00	\$6,000.00	\$10,600.00	\$5,000.00	\$15,000.00	\$5,000.00	\$25,000.00	\$5,000.00	\$8,000.00	
	Project management	\$40,000.00	Cost	\$2,000.00	\$5,000.00	\$5,000.00	\$5,000.00	\$5,000.00	\$5,000.00	\$5,000.00	\$5,000.00	\$3,000.00	
	Start	\$3,000.00	Cost	\$3,000.00									
	Task	\$2,000.00	Cost	\$400.00	\$1,000.00	\$600.00							
	Milestone A	\$5,000.00	Cost			\$5,000.00							
	Milestone B	\$10,000.00	Cost					\$10,000.00					
	Milestone C	\$20,000.00	Cost						\$20,000.00				
	Milestone D	\$5,000.00	Cost								\$5,000.00		
			Cost										

Name	Totals	13-Apr	20-Apr	27-Apr	4-May	11-May	18-May	25-May	1-Jun	8-Jun
Project management	\$40,000	\$2,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$3,000
Start	\$3,000	\$3,000								
Task	\$2,000	\$400	\$1,000	\$600						
Milestone A	\$5,000			\$5,000						
Milestone B	\$10,000					\$10,000				
Milestone C	\$20,000							\$20,000		
Milestone D	\$5,000									\$5,000
Planned Value inc	\$85,000	\$5,400	\$6,000	\$10,600	\$5,000	\$15,000	\$5,000	\$25,000	\$5,000	\$8,000
Planned Value cum		\$5,400	\$11,400	\$22,000	\$27,000	\$42,000	\$47,000	\$72,000	\$77,000	\$85,000

Warning - Do not use the Planned Value (BCWS) field in MS Project due to inconsistencies with the way it deals with Status date, always use the Excel extract.

2.7 Baseline control

Baseline change will need to be carefully managed:

- Copy/Paste cannot be used once Baseline is set
- Deleting Baseline activities with costs assigned will affect EV calculations. It is better to allocate a new Resource called "Baseline change", allocate a negative value equivalent to the original value then set any task/milestone with costs assigned but no longer needed to be 100% complete as of the date of Baseline change along with text "NOT NEEDED". It would be OK to delete any task/milestone no longer required which does not have costs assigned of course.
- Resetting the Baseline on existing activities is not recommended unless a major replan has been done.
- New tasks/milestones can be added, if costs are involved then allocate via a Resource called "Baseline change". Set the Baseline on the new tasks/milestones by exception but be careful it is consistent with the rest of the Baseline.

A manual check will need to be put in place to verify/validate Baseline in the schedules before extracting EV data. A simple way may be to verify the total Baseline cost at the project summary level against the Excel spreadsheet BAC.

3 Deriving Earned Value (EV) from MS Project

3.1 Schedule statusing

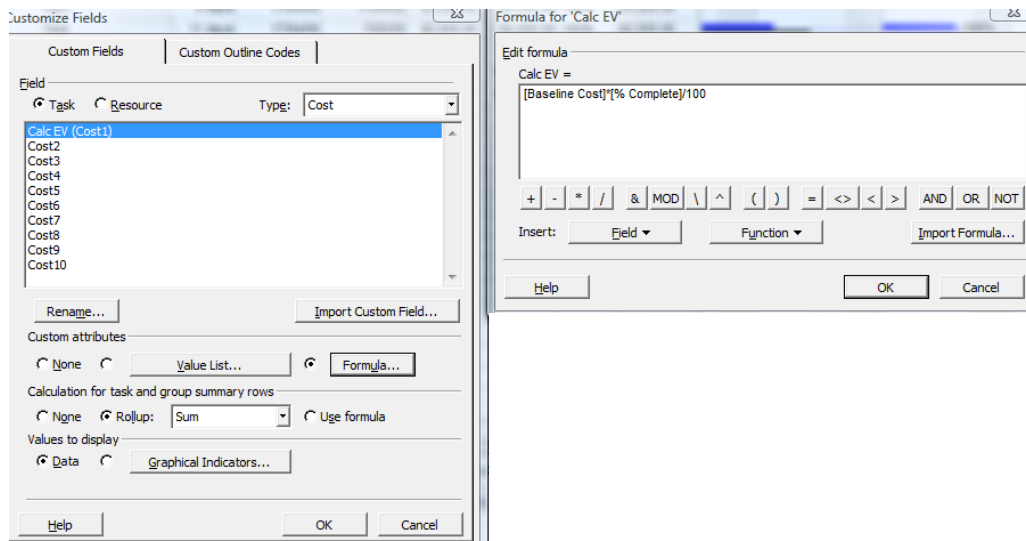
Schedules will need to be statused as per the techniques covered in our other guides. The technique recommended is through the entry of Actual dates, Actual Duration and Remaining Duration, with remaining work rescheduled after the Status date. A key will be to align the Status date with accounting system cut off date. Any tasks where status is unavailable shall carry over previous status and not be assumed to be complete. This will most likely lower the Earned Value however.

3.2 Calculated field

Due to inconsistencies within MS Project in the calculation of Earned Value relating to the Status date, a more reliable method for EV calculation is to customise a field using a formula:

1. From the menu, select **Tools, Customise, Fields**
2. Start by selecting **Cost1** and renaming it "**Calc EV**"
3. Click **Formula** and enter as per below then click **OK**

$$[\text{Baseline Cost}] * [\% \text{ Complete}] / 100$$
4. For Calculation of Summary rows, click **Rollup** then select **Sum**
5. Click **OK**
6. Add Calc EV to the Gantt table as well as % Complete and verify field is working through a couple of simple tests.



Warning - Do not use the Earned Value (BCWP) field in MS Project due to inconsistencies with the way it deals with Status date, always use the technique shown above.

3.3 More complex EV

More complex methods of EV measurement could be catered to using the formulas and/or the field "Physical % Complete". This may include asking for a subjective measure of % Complete during Status collection then applying it to discrete elements.

3.4 Extracting EV

Extracting EV is a simple process of reading off the Calculated EV value against the Project summary and entering in the spreadsheet as the cumulative figure. An incremental figure can then be derived by comparing to the previous period EV figure.

4 Actual Costs (AC)

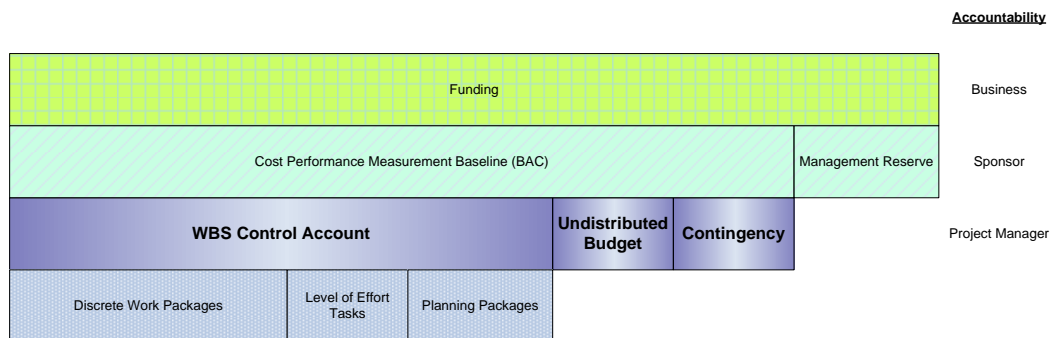
Actual costs should be easy enough to get from the accounting system. Ensure there is enough time after month end to include last minute invoice and timesheet processing. Include Accruals or Estimated Actuals as necessary for invoices not received, Timesheet not entered etc. Enter Actual cost into spreadsheet, either incremental or cumulative and calculate as necessary.

5 Contingency/Management Reserve

Contingency/Management Reserve is one of the more complex areas of Cost Management.

Typically Management Reserve forms part of the Budget, in other words it is planned to be used. Usually Management Reserve is there to be allocated to unexpected additional in scope work, eg rework. It should not be used to mask over spend, remember budget and scope are tied together. Management Reserve is not to be confused with Undistributed budgets or Risk budgets. There are often rules around when and how MR can be used, usually it is up to the Steering Committee and/or Sponsor (advised by the Project manager) to distribute.

Some plans have formal Risk budgets set up as a result of risk planning, they are considered Undistributed budgets and are included in the Baseline. Risk budgets are typically used for risk response plans (reducing likelihood, reducing impact) and sometimes to fund the impact.



5.1 How to handle MR

Management Reserve is best kept as a separate control account with Baseline change used to move budget across to active control accounts. It can be included and/or excluded from reports as necessary. In MS Project it would be via a separate Resource named "MR" which is allocated to a Contingency task, scheduled always in the future and always 0%, hence \$0 Earned Value.

6 EV Analysis

Typical analysis of EV and Cost data includes:

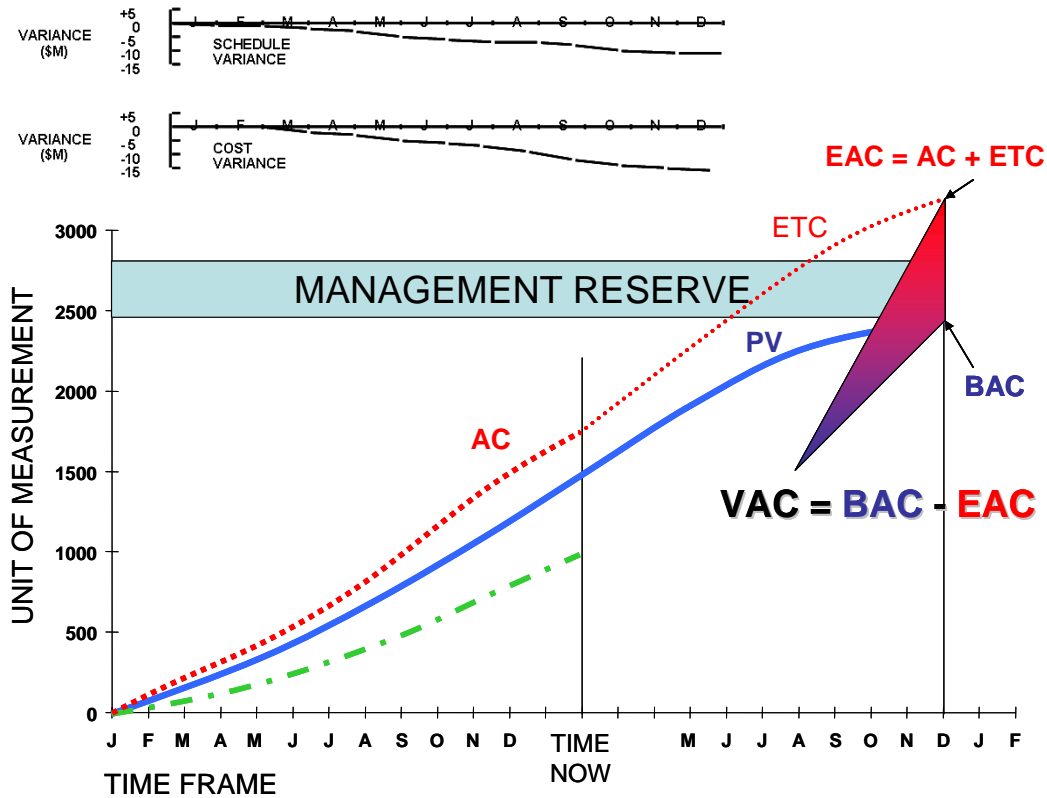
$$SV = EV - PV \quad \text{Schedule Variance (-ve bad)}$$

$$CV = EV - AC \quad \text{Cost variance (-ve bad)}$$

$$SPI = EV / PV \quad \text{Schedule Performance Index (<1.0 bad)}$$

$$CPI = EV / AC \quad \text{Cost Performance Index (<1.0 bad)}$$

The best form of analysis is graphical. Cumulative graphs as well as graphing of performance indices can be particularly useful.



Analysis can also include independent assessment of the Estimate at Complete (EAC) known as IEAC, these can be used to validate the Project manager’s EAC and can be compared with Budget at Completion (BAC).

Some typical formulas include:

- $AC + (BAC - EV) / CPI$
- $AC + (BAC - EV) / (0.8 \times CPI + 0.2 \times SPI)$