Simple Earned Value (Using MS Project 2010)

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. Earned Value is typically done based on dollar amounts but can also be done using manhours or quantities.

Earned Value provides a third dimension to cost reporting. Most financial project reporting provides Budget vs Actual costs. Some systems time phase the Budget (Planned Value) 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 the 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) at the project level or Work Package level
- Recording of Actual costs against the project level or Work Package level
- Recording of Earned Value against the same work packages and in the same reporting period as the Actual cost 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 is considered as a discrete WBS scope piece:
The diagram above shows information flow in a typical EVM System using MS Project, note the need for a EV calculation spreadsheet.

Note, in MS Project % Complete is % of Duration complete, this should never be forgotten and users should not try to disconnect the two fields. Percent Complete is calculated by the tool, not user entered. There are also other percent complete fields including a “Physical Percent Complete which could provide an option to those wanting a more complex Earned Value solution where users enter the percent complete.

**Step 1 - Establish the Performance Measurement Baseline (Planned Value curve)**

**Estimating**
Detailed estimates will need to be created for each WBS element, these are typically built and refined progressively over a number of weeks in conjunction with scheduling. Estimates, by their very nature, include both labour and fixed costs plus allowances for risk and uncertainty. For more information on Estimating, refer the CCG Estimating and Cost Management standard and associated templates.

**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 an agreed “Status date” and Baselined from a date perspective once the schedule is agreed/signed off.

**Determining the 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. Hopefully you will have manhours for major elements. One technique we have used 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.

**Allocating dollars to Tasks and Milestones**
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. Note the technique will multiply the duration based percent complete by the Baseline cost.

To assign dollars directly to tasks or Milestones:

1. Set up a new resource, eg “Vendor”
2. Double click resource, change **Type** to **Cost**.
3. **Assign** to task then change cost amount via the Assign Resources form.
Hint: Add the Costs column to the table section of the Gantt Chart to see the costs accrue. Never use the column “Fixed Costs”, they do not form part of the time phased costing extracted via Resource Usage views. Do not allocate costs to Summaries.

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 to set on Late dates, they should temporarily set all As Soon as Possible tasks to As Late As Possible or manually manipulate schedule before extracting Planned value figures.

To extract the Time phased budget (from the Baseline file):
1. From the Project tab, select Visual Reports
2. Select time period, typically Months
3. Select New Template
4. Select Excel and Resource Usage
5. Use Field Picker to Remove All, then add only Cost
6. Click OK then OK
7. In Excel click on right hand side “Cost” and “Monthly Calendar”, on the left hand side expand the time period to show the monthly data as per the example below
8. Then Copy/Paste it into your control spreadsheet and include formulas for cumulative values, graphs etc.

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<th>C</th>
<th>D</th>
<th>E</th>
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</thead>
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<td>Month</td>
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<td></td>
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<td>Grand Total</td>
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<tr>
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<td>3</td>
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</tbody>
</table>

To extract the Time phased budget via the Resource Usage view:
1. Change view to Resource Usage
2. Add Cost column to table if not already there
3. Adjust Timescale to monthly
4. Format, Details to show Cost only
5. Group and/or roll up assignments as need be
6. 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.
7. Tidy up as need be in Excel separating incremental and cumulative data, prepare graphs etc.
Warning - Do not use the BCWS field in MS Project, due to inconsistencies with the way it deals with Status date it cannot be trusted.

Baseline control
Baseline change will need to be carefully managed in the schedule:
- Copy/Paste of tasks and milestones 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.
- 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 reconciliation check will need to be put in place to verify/validate Baseline costs 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.

Step 2 – Set up MS Project calculated field

Due to inconsistencies within MS Project in the calculation of Earned Value (BCWP) relating to the Status date, a trusted method for EV calculation is to customise a field using a formula (with a Gantt Chart or similar view active):
1. From the Format tab, select Custom Fields
2. Select Cost1 and renaming it “Calc EV”
3. Click Formula and enter
   \[\text{Baseline Cost} \times \% \text{ Complete} \div 100\]
4. Click OK then for “Calculation for task and group summary rows” click Rollup then select Sum
5. Click OK
6. Add the “Calc EV” field to the Gantt table as well as % Complete and verify field is working through a couple of simple tests.
**Warning - Do not use the BCWP field in MS Project, due to inconsistencies with the way it deals with Status date it cannot be trusted.**

**Step 3 – Status update**

**Status date**

A key to the reporting will be the “Status date”, considered 5pm. At this point all Tasks/Milestones to the left of the Status date will need to be set as complete, otherwise they need to be rescheduled to the right of the Status date. In progress tasks will need to show actual work/duration up to the Status date and remaining work/duration after the Status date.

It is recommended that end of month Status dates are used as this typically coincides with finance cut off. It is easier to move the schedule status date than change finance cut off timing.

**Actual Costs**

Actual costs should be easy enough to get from the accounting system, usually available within 3-4 days after the end of month. Actual costs may be at the project level or a more detailed Work package level depending on the accounting system and cost codes. Include Accruals (or Estimated Actuals) as necessary for invoices not received, Timesheet not entered etc. Enter Actual costs into your tracking spreadsheet, typically incremental. A cumulative figure can then be derived using a simple formula.

**Extracting Earned Value**

Assuming the Baseline was set and maintained, extracting EV from MS Project is a simple process of reading off the “Calc EV” value against the Project summary (or work package if doing this at a lower level) and entering in the tracking spreadsheet as a cumulative figure. An incremental figure can then be derived using a simple formula.

**Step 4 – Reporting**

Since Excel is used, numerous options are available for reporting, at a project level or at Work Package level if the data is available, including:

- Derivation of variance values (Schedule Variance, Cost Variance, Variance at Completion)
- Derivation if indices (Schedule Performance Index, Cost Performance Index)
- Derivation of an Independent Estimate at Complete
- Graphical analysis including determination of Schedule Variance from a time perspective
- Graphical analysis of indices trends
Useful EV formulas include:

\[ SV = EV - PV \]  
Schedule Variance (-ve bad)

\[ CV = EV - AC \]  
Cost variance (-ve bad)

\[ SPI = EV / PV \]  
Schedule Performance Index (<1.0 bad)

\[ CPI = EV / AC \]  
Cost Performance Index (<1.0 bad)

\[ IEAC = AC + \frac{(BAC - EV)}{CPI} \]

or

\[ IEAC = AC + \frac{(BAC - EV)}{(0.8 \times CPI + 0.2 \times SPI)} \]

Complexities

More complex EV measurement techniques

More complex methods of EV measurement could be catered to such as other Earned Value Techniques using additional custom fields, IF statements and possibly the Physical Percent Complete field. This may include asking for a subjective measure of % Complete during Status collection then applying it to discrete elements, something that takes a lot more effort. Implementing such a system is beyond the scope of these notes.

Contingency/Management Reserve

Core Consulting Group has adopted the following definitions:

- **Project Contingency** – An amount of Budget set aside for managing undefined Risks and addressing unknowns, controlled by the Project Manager and authorised by the project Governance authority. Project Contingency is included in the Performance Measurement Baseline, is usually considered “Undistributed budget” and controlled through formal Baseline change.

- **Management Reserve** – An amount of Budget set aside by the sponsor for managing scope change and risks beyond the control of the project. It is typically controlled by the sponsor or higher level governance authorities and is not considered part of the Performance Measurement Baseline.

Contingency/Management Reserve is one of the more complex areas of Cost Management. Typically Contingency forms part of the Baseline for EVM, in other words it is planned to be used. Contingency is also used for unexpected additional in scope work, eg rework. It should not be used to mask over spend.
In EVM Budget and scope are tied together, you cannot change one without changing the other. Contingency should not to be confused with Undistributed budget (budget not yet assigned to Work Packages) or Risk budgets (for managing defined risks). There are often rules around when and how Contingency can be used, usually it is up to the Steering Committee and/or Sponsor (advised by the Project manager) to authorise. Some projects also 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 of a risk.

Contingency 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, unused Contingency would be via allocated a separate Resource named “Contingency” which is allocated to tasks such as “Contingency allowance” or “Rework allowance”, scheduled only in the future (always 0%). Allocated Contingency would be done by using the same resource “Contingency” but allocated where it is required, including completed activities. The allocated Contingency and the unused Contingency should add up and reconcile to the total Contingency budget.