

1. PERT (Program Evaluation and Review Technique) Analysis

$$\text{PERT Duration Estimate} = (P + 4M + O) / 6$$

Where:

P = Pessimistic Duration Estimate

M = Most Likely Duration Estimate

O = Optimistic Duration Estimate

- ◆ Used when a task has a great amount of uncertainty
- ◆ By creating 3 distinct estimates (P, M & O) and using the above formula to calculate your working estimate, you have factored in the uncertainty
- ◆ Final estimates will be appropriate should your tasks come in with a normal distribution of variation

$$SD = (P - O) / 6$$

Where:

SD = Standard Deviation

$$TV = [(P - O) / 6]^2$$

Where:

TV = Task Variance

$$PV = \sqrt{\text{sum (TV)}}$$

Where:

PV = Project Variance

- ◆ Used to calculate the task and project variance
- ◆ A larger variance indicates greater uncertainty within the estimates
- ◆ Can be used as a +/- degree of certainty



2. Communications Channels

$$CC = N (N-1) / 2$$

Where:

CC = Number of Communication Channels that Exist

N = Number of Entities / People who Need to Communicate

- ◆ Used to calculate the number of unique communications channels that exist
- ◆ Helps in understanding the potential complexity of communication

3. Investment Determinations

Present Value (PV)

$$PV = FV / (1 + r)^n$$

Where:

FV = future (forecasted) cash flows of an initiative (revenue or cost)

r = interest rate

n = number of time periods

- ◆ Used to calculate the current value of future cash flows
- ◆ Assists in project initiative spending decisions by comparing anticipated benefits from uncertain projects with typical investment strategies



Net Present Value (NPV)

NPV = sum (PV revenue cash flows) – sum (PV cost cash flows)

- ◆ **Used to calculate the current value of the total anticipated benefits of a potential initiative**
- ◆ **Used to compare possible investment initiatives**

Internal Rate of Return (IRR)

- ◆ **Used to compare the anticipated rate of return of multiple initiatives**

Payback Period

- ◆ **Number of time periods it takes to recover your investment in the project (i.e. total revenue=total cost) and start generating incremental revenue**
- ◆ **Used to compare possible investment initiatives**

Benefit Cost Ratio (BCR)

BCR = benefits (revenue) / cost

- ◆ **If BCR > 1, the initiative benefits are anticipated to outweigh the costs**
- ◆ **Used to compare the ratio of benefits to costs of multiple initiatives**

Opportunity Cost

- ◆ **The NPV lost by choosing to not complete an initiative**



Sunk Cost

- ◆ **Costs that have already been spent and should not factor into future investment decisions (including project continuance)**

Law of Diminishing Returns

- ◆ **The principal that states the more that you put into something, the less you get out of it. BCR is the mathematical basis for the law**
- ◆ **Beyond strict math, the principal is used to counter flawed logic such as doubling resources will half duration**

Working Capital (WC)

WC = current assets – current liabilities

- ◆ **Represents the amount of money available to an organization to invest in initiatives**

4. Earned Value Analysis Formulas

Cost

EV = % complete x BAC (calculated at task or work product level, result is summed for project EV)

***CV = EV – AC**

***CPI = EV / AC**

***EAC = AC + (BAC - EV) / CPI**

***EAC = BAC / CPI (simpler equivalent of above formula)**

***ETC = EAC – AC**



***VAC = BAC – EAC**

***V = BAC – AC (calculated at completion)**

* can be calculated at task or work product level, generally used at a project level

Where:

EV = Earned Value (formerly BCWP, Budgeted Cost of Work Performed)

BAC = Budgeted at Completion

CV = Cost Variance

AC = Actual Cost (formerly ACWP, Actual Cost of Work Performed)

CPI = Cost Performance Index (<1 Over Spending, >1 Under Spending)

EAC = Estimate at Completion

ETC = Estimate to Complete

VAC = Variance at Completion

- ◆ Used to track cost variances, calculate cost estimating accuracy and forecast future costs (and total project cost) based on early results
- ◆ Requires detailed budgeting and task completion percent tracking at a task or work product level
- ◆ Practically, requires project management software (PMS)

Schedule

***SV = EV – PV**

***SPI = EV / PV**

* can be calculated at task or work product level, generally used at a project level

Where:

SV = Schedule Variance (Expressed in Dollars)

EV = Earned Value (formerly BCWP, Budgeted Cost of Work Performed)

PV = Planned Value (formerly BCWS, Budgeted Cost of Work Scheduled)

SPI = Schedule Performance Index (<1 Over Spending, >1 Under Spending)

- ◆ Used to schedule variances, calculate schedule duration estimating accuracy and forecast future durations (and total project duration) based on early results



- ◆ Requires detailed budgeting, project network diagram creation and task completion percent tracking at a task or work product level
- ◆ Practically, requires project management software (PMS)

5. Normal Distribution (Sigma or Standard Deviation)

+/- 1 Sigma = 68.26%

+/- 2 Sigma = 95.46%

+/- 3 Sigma = 99.73%

+/- 4 Sigma = 99.99%

- ◆ Used as a quality standard, 3 or 6 Sigma represents a target (upper and lower control limits) for defect-free performance

6. Project Schedule Buffer

Sum of the Squares

Buffer = $\sqrt{\text{sum}(M^2)}$

Where:

M = Most Likely Duration Estimate (often of just critical path activities)

- ◆ Used to determine an appropriate duration for the schedule buffer
- ◆ Many other approaches exist including using an arbitrary % of the critical path duration

Best-practice is to divide the buffer into 3 buffers. The first 1/3rd, the green buffer, can be used without concern. When the project begins using the second 1/3rd, the yellow buffer, the project requires tight control. When the team begins to use the final 1/3rd, the red buffer, the project is in real danger of running overtime.



7. Accuracy of Estimates

Order of Magnitude Estimate (Initiation) = -25% to +75

Budget Estimate (Planning) = -10% to +25%

Definitive Estimate (Late Planning / Partial Execution) = -5% to +10%.

8. Risk – Expected Value (EV)

EV = Probability x Impact

- ◆ **Used to determine the expected value of a risk event**
- ◆ **The sum of the EV, can be used to determine the project reserve (risk contingency budget)**

