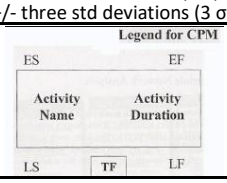
Integration Management – *Develop Project Charter process* – Project Selection Methods (>> Benefit Measurement Methods >> Economic Models 1-7)

S#	What?	Formula	Additional Notes
1	Present Value (PV)	$PV = \frac{FV}{(1+R)^n}$	The result – amount of money to invest today (**PV**) for **n years** at **r % interest** in order to end up with the target sum (**FV – Future Value**). bigger the better.
2	Payback Period	Net Investment / Average Annual cash flow	Length of time it takes the company to get back the initial cost of producing a product/service. shorter the better
3	Net Present Value (NPV)	The PV of the total benefits (income or revenue) less the costs.	NPV is a much more precise capital budgeting method than payback period. bigger the better
4	Internal Rate of Return (IRR)	The interest rate at which the present value of the cash flows equals the initial investment. **Tip:** Interest from Bank A/c	IRR is a more precise (and more conservative) capital budgeting method than NPV. bigger the better
5	Benefit Cost Ratio	BCR = (Revenue / Cost)	Cost Benefit Analysis. bigger the better
6	Return on Invested Capital	Net Income (after tax) from proj / Total Capital invested in the proj	bigger the better
7	Economic Value Add Benefit Measurement	**EVA** = Net Operating Profit After Tax – Cost of Capital – (Investment Capital X % Cost of Capital)	bigger is better Cost of Capital = (Revenue - Op. Exp - Taxes)
8	Opportunity Cost	value of the project not selected	smaller the better
9	Working Capital	Current Assets – Current Liabilities	
10	Return on Sales (ROS)	NIBT / Total Sales (OR) NIAT / Total Sales	NIBT - Net Income Before Taxes
11	Return on Assets (ROA)	NIBT / Total Assets (OR) NIAT / Total Assets	NIAT - Net Income After Taxes
12	Return on Investment (ROI)	NIBT / Total Investment (OR) NIAT / Total Investment	bigger the better
13	Discounted Cash Flow	Cash Flow X Discount Factor	

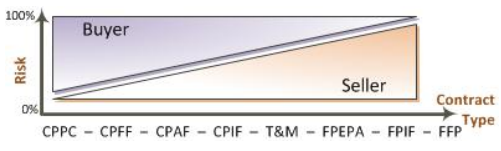
Schedule Management

Precedence Diagramming Method (PDM / AON) ***Sequence Activities Process***	**Finish-to-Start(FS):** *An activity **must*** finish ***before** the successor can* start. (dig hole; plant tree)(most common) **Start-to-Start (SS):** *An activity **must*** start ***before** the successor can* start. **Finish-to-Finish (FF):** *An activity **must*** finish ***before** the successor can* finish. **Start-to-Finish (SF):** *An activity **must*** start ***before** the successor can* finish. (rarely used) **Lead:** A lead can be added to start an activity before completion of the predecessor (Ex: Start writing Training Material before completion of Testing) **Lag:** is inserted waiting time b/w activities (Ex: needing to wait 3 days after pouring concrete before constructing the frame of the house)

S#	What?	Formula	Additional Notes
1	Triangular Distribution / 3P Estimate	(P + M + O) / 3	***Estimate Activity Durations Process*** **Duration/Cost :–** * P – Pessimistic; M - Most Likely (Realistic); O – Optimistic * PERT is *probabilistic,* using *statistical estimates* of durations (left) * Estimate range for an activity = PERT duration +/- standard deviation * Std deviation tells the amt of uncertainty/risk involved in the estimate for the activity * There is 68% probability that the work will finish within +/- one std deviation (1 σ) * There is 95% probability that the work will finish within +/- two std deviations (2 σ) * There is 99% probability that the work will finish within +/- three std deviations (3 σ)
2	Weighted 3P Estimate / PERT (Program Evaluation & Review Technique) / Expected Value (modified BETA distribution)	$\frac{P + 4M + O}{6}$	
3	Standard Deviation (σ)	$\sigma = \frac{P - O}{6}$	
4	Variance (v)	$v = \left[\frac{P - O}{6}\right]^2$	
5	Total Float / Slack (There is a start formula & a finish formula; & both begin with Late)	(LS – ES) or (LF - EF)	***Develop Schedule Process* – Critical Path Method** (CPM is *deterministic* , using *specific durations*) ES – Early Start; EF – Early Finish; LS – Late Start; LF – Late Finish; TF – Total Float
6	Activity Duration	(EF – ES) or (LF – LS)	
7	Forward Pass: (Add 1 day to Early Start)	EF = (ES + Duration - 1)	
8	Backward Pass: (Minus 1 day to Late Finish)	LS = (LF - Duration + 1)	



Procurement Management

S#	What?	Formula	Additional Notes
1	Contract Types – Risk Levels		**CPPC – CPFF – CPAF – CPIF – T&M – FPEPA – FPAF – FPIF – FFP** **Cost Reimbursable (CR)** – (Cost Plus Award Fee/CPAF, Cost Plus Incentive Fee/CPIF, Cost Plus Fixed Fee/CPFF) **Time & Material (T&M)** **Fixed Price (FP)** – (Fixed Price Economic Price Adjustment/FP-EPA, Fixed Price Incentive Fee/FPIF, Firm Fixed Price/FFP)
2	Sharing Ratio	Y% / Z% (eg. 80%/20%)	How cost savings or overrun will be shared. Y% – buyer's share ratio & Z% – seller's share ratio
3	Target Price (TP)	TP = TC + TF	TC – Target Cost TF – Target Fee AC – Actual Cost AF – Actual Fee (Profit)
4	Final Price (FP)	FP = AC + AF	
5	Actual Fee (AF)	Actual Fee (AF) = TF + Z% * (TC-AC)	
6	Contract related formulas	Savings = TC – AC Bonus = Savings x Percentage (Seller's Share Ratio) Contract Cost = Bonus + Fees Total Cost = AC + Contract Cost = AC + Fees + Bonus	
7	Point of Total Assumption (PTA)	$\left(\frac{CP - TP}{Y\%}\right)$	PTA *only* relates to FPIF contracts. ((Ceiling Price - Target Price)/buyer's Share Ratio) + Target Cost
8	Source Selection	(Weightage X Price) + (Weightage X Quality)	Conduct Procurements – Selection of Vendor using 'Weighing System'

Cost Management – Earned Value Measurement (EVM) – *Control Costs Process*

Term	Expansion	Interpretation
PV (BCWS)	Planned Value (Budgeted Cost of Work Scheduled)	As of today, What is the *estimated value of the work planned to be done*? How much work (value) was expected to be finished at this point of time?
EV (BCWP)	Earned Value (Budgeted Cost of Work Performed)	As of today, What is the *estimated value of the work actually accomplished*? How much work (value) has actually been completed at this point of time?
AC (ACWP)	Actual Cost (Actual Cost of Work Performed)	As of today, What is the *actual cost incurred for the work accomplished*?
BAC	Budget At Completion	How much did we BUDGET for the TOTAL project effort?
CV	Cost Variance	How much more/less has the completed work cost compared to what was planned?
SV	Schedule Variance	How much more/less work has been accomplished compared to what was planned?
CPI	Cost Performance Index	How much is the work being completed costing compared to what was planned? Know whether over or under budget?
SPI	Schedule Performance Index	How does the work being completed compare to what was planned in the schedule? Know if ahead or behind schedule?
EAC	Estimate At Completion	What do we currently expect the TOTAL project (at completion) to cost (a forecast)?
ETC	Estimate To Complete	From now on, how much MORE money will it take to finish the project (a forecast)?
VAC	Variance At Completion	As of today, How much over or under budget (will the total project cost be?) do we expect to be at the end of the project?
TCPI	To Complete Performance Index (Based on BAC & EAC)	What level of performance must future project work meet in order to meet the budget (BAC)? What level of performance must future project meet in order to meet the project's cost based on past performance (EAC)?

Alphabetical Order (A,E,P) (C,S) ----- >

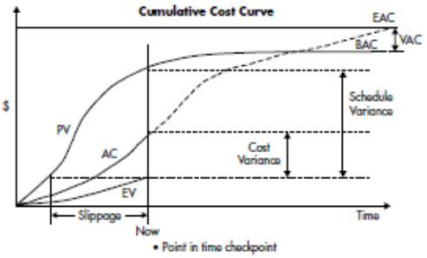
Data → **AC** *op* **EV** *op* **PV**

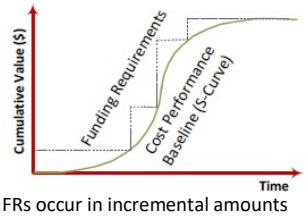
Variances → **CV** = <<--- (-) ---- (-) >> **=SV**

Indices → **CPI**= <<--- (/) ---- (/) >> **=SPI**

Tips: Most formulas start with EV — -EV is bad; +EV is good
If Variance: EV "–"Something — If Cost related use AC
If Index: EV "/" Something — If Schedule related use PV

Notes: CV & SV are known as progress formula.
CPI & SPI are known as efficiency indicators.





FRs occur in incremental amounts (steps) that are not continuous

S#	What?	Formula	Additional Notes
1	PV	(P%C) * BAC	P%C – Planned % Complete. PV is also called BCWS.
2	EV	(A%C) * BAC	A%C – A ctual % Complete. EV is also called BCWP.
3	CV	EV – AC	NEGATIVE is over budget, POSITIVE is under budget. @ End of project, CV = BAC – AC
4	SV	EV – PV	NEGATIVE is behind schedule, POSITIVE is ahead of schedule
5	CPI	EV / AC	Efficiency in usage of Funds. We are getting $ __ worth of work out of every $1 spent. CPI **> 1**, Efficiency in utilizing the resources allocated to the project is **good** **< 1**, Efficiency in utilizing the resources allocated to the project is **bad**
6	SPI	EV / PV	We are (only) progressing at __ % of the rate originally planned. SPI > 1 Mean more work was completed than was planned; < 1 Mean less work was completed than was planned
7	EAC	(BAC / CPI)	Used if no variances from BAC (or) proj will continue at the **same rate of spending**. = same as AC + ((BAC – EV) / CPI)
		AC + Bottom-up ETC	Used when original estimate was fundamentally flawed. AC + a new estimate for remaining work
		AC + (BAC – EV)	Used when current variances are thought to be **atypical** of future. AC + (remaining value of work @ **budgeted** rate)
		$AC + \frac{(BAC - EV)}{CPI * SPI}$	Used when current variances are thought to be **typical** of future. AC + remaining **budget modified by performance**
8	ETC	EAC – AC	A more accurate way is to *re-estimate cost of the remaining work from the bottom-up*.
9	VAC	BAC – EAC	How much over or under budget will we be at the end of the project?
10	$TCPI_{BAC}$	(BAC – EV) / (BAC – AC)	Values for the TCPI index of less than 1.0 is good because it indicates the efficiency to complete is less than planned.
	$TCPI_{EAC}$	(BAC – EV) / (EAC – AC)	How efficient must the project team be to complete the remaining work with the remaining money?
11	Estimate Ranges	***Estimate Costs Process*** *(Oh Boy Dave – Its Pepperoni Pizza)*	**Order of Magnitude** *(Oh)* **– Initiating** *(Its)*: -25% to +75% or (**ROM:** -/+ 50%; PMBOK 7.1 P168) **Budget(ary)** *(Boy)* **– Planning** *(Pepperoni)*: -10% to +25% **Definitive** *(Dave)* **– Planning** *(Pizza)*: -5% to +10% (-10% to +15% PMBOK)
12	Cost Aggregation	***Determine Budget Process***	**Contingency Reserves:** to address cost impacts of remaining risks after risk response planning (known risks). Project Estimates + Contingency Reserves = **Cost Baseline** **Management Reserves:** extra funds set aside to cover unforeseen risks (unknown risks). Cost Baseline + Management Reserves = **Cost Budget / Project Funding Requirement**
13		Rules Based on Numbers	**80 Hour Rule** – Max size of work packages **80/20 Rule** – Pareto's Law – 80% of problems are due to 20% of causes **0/50/100** – Work Package completion. No credit until 50% complete. No additional credit until 100% complete

Quality Management

S#	What?	Formula
1	Standard Deviation / Sigma σ	1σ = 68.27%; 2σ = 95.45%; 3σ = 99.73%; ---------- 6σ = 99.99985%

Communication Management

S#	What?	Formula
1	Number of Communication Channels (N - # of project members including Project Manager)	$\frac{[N(N-1)]}{2}$

Risk Management

S#	What?	Formula
1	Expected Monetary Value / EMV (or) Contingency Reserve ($\sum$ P*I of known Risks)	Probability * Impact