

PMP Formulae & Tips – Cheat Sheet 😊

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	

Time Management

<p>Precedence Diagramming Method (PDM / AON)</p> <p>Sequence Activities Process</p>	<p>Finish-to-Start(FS): An activity must finish before the successor can start. (dig hole; plant tree)(most common)</p> <p>Start-to-Start (SS): An activity must start before the successor can start.</p> <p>Finish-to-Finish (FF): An activity must finish before the successor can finish.</p> <p>Start-to-Finish (SF): An activity must start before the successor can finish. (rarely used)</p> <p>Lead: A lead can be added to start an activity before completion of the predecessor (Ex: Start writing Training Material before completion of Testing)</p> <p>Lag: is inserted waiting time b/w activities (Ex: needing to wait 3 days after pouring concrete before constructing the frame of the house)</p>
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S#	What?	Formula	Additional Notes								
1	Triangular Distribution / 3P Estimate	(P + M + O) / 3	<p style="text-align: center;">Estimate Activity Durations Process</p> <p>Duration/Cost :- * P – Pessimistic; M – Most Likely (Realistic); O – Optimistic</p> <p>* PERT is <i>probabilistic</i>, using <i>statistical estimates</i> of durations (left)</p> <p>* Estimate range for an activity = PERT duration +/- standard deviation</p> <p>* Std deviation tells the amt of uncertainty/risk involved in the estimate for the activity</p> <p>* There is 68% probability that the work will finish within +/- one std deviation (1 σ)</p> <p>* There is 95% probability that the work will finish within +/- two std deviations (2 σ)</p> <p>* There is 99% probability that the work will finish within +/- three std deviations (3 σ)</p>								
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)	<p>Develop Schedule Process – Critical Path Method (CPM is <i>deterministic</i>, using <i>specific durations</i>)</p> <p style="text-align: center;">ES – Early Start; EF – Early Finish; LS – Late Start; LF – Late Finish; TF – Total Float</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center; font-size: small;">Legend for CPM</p> <table style="width: 100%; text-align: center; border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px;">ES</td> <td style="border: 1px solid black; padding: 2px;">EF</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">Activity Name</td> <td style="border: 1px solid black; padding: 2px;">Activity Duration</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">LS</td> <td style="border: 1px solid black; padding: 2px;">LF</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px;">TF</td> <td></td> </tr> </table> </div>	ES	EF	Activity Name	Activity Duration	LS	LF	TF	
ES	EF										
Activity Name	Activity Duration										
LS	LF										
TF											
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		<p style="text-align: center;">CPPC – CPFF – CPAF – CPIF – T&M – FPEPA – FPAF – FPIF – FFP</p> <p>Cost Reimbursable (CR) – (Cost Plus Award Fee/CPAF, Cost Plus Incentive Fee/CPIF, Cost Plus Fixed Fee/CPFF)</p> <p>Time & Material (T&M)</p> <p>Fixed Price (FP) – (Fixed Price Economic Price Adjustment/FP-EPA, Fixed Price Incentive Fee/FPIF, Firm Fixed Price/FFP)</p>
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	<p>TC – Target Cost TF – Target Fee AC – Actual Cost AF – Actual Fee (Profit)</p>
4	Final Price (FP)	FP = AC + AF	
5	Actual Fee (AF)	Actual Fee (AF) = TF + Z% * (TC-AC)	
6	Contract related formulas	<p>Savings = TC – AC</p> <p>Bonus = Savings x Percentage (Seller’s Share Ratio)</p> <p>Contract Cost = Bonus + Fees</p> <p>Total Cost = AC + Contract Cost = AC + Fees + Bonus</p>	
7	Point of Total Assumption (PTA)	$PTA = \left(\frac{CP - TP}{Y\%}\right) + TC$	PTA <i>only</i> 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 <i>estimated value of the work planned to be done</i> ? 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 <i>estimated value of the work actually accomplished</i> ? 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 <i>actual cost incurred for the work accomplished</i> ?
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

Variations → CV = ● <--- (-) ---■--- (-) --->> ● =SV

Indices → CPI = ● <--- (/) ---■--- (/) --->> ● =SPI

Tips: Most formulas start with EV
If Variance: EV “-” Something
If Index: EV “/” Something

-ve is bad; +ve is good
If Cost related use AC
If Schedule related use PV

Notes: CV & SV are known as progress formulae.
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 <i>re-estimate cost of the remaining work from the bottom-up</i> .
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	<i>Estimate Costs Process</i> (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	<i>Determine Budget Process</i>	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 (∑ P*I of known Risks)	Probability * Impact

Process Groups & Knowledge Areas – Mapping

PGs >> KAs	Initiating	Planning	Executing	Monitoring & Controlling	Closing
Integration Management – (6)	Develop Project Charter	Develop Project Management Plan	Direct & Manage Project Execution	Monitor & Control Project Work Perform Integrated Change Control	Close Project or Phase
(5) – Scope Management		Collect Requirements Define Scope Create WBS		Verify Scope Control Scope	
Time Management		Define Activities Sequence Activities Estimate Activity Resources Estimate Activity Durations Develop Schedule		Control Schedule	
(3) – Cost Management		Estimate Costs Determine Budget		Control Costs	
(3) – Quality Management		Plan Quality	Perform Quality Assurance	Perform Quality Control	
(4) – Human Resource Management		Develop Human Resource Plan	Acquire team Develop Team Manage Team		
Communication Management – (5)	Identify Stakeholders	Plan Communications	Distribute Information Manage Stakeholder Expectations	Report Performance	
Risk Management		Plan Risk Management Identify Risks Perform Qualitative Risk Analysis Perform Quantitative Risk Analysis Plan Risk Responses		Monitor & Control Risks	
(4) – Procurement Management		Plan Procurements	Conduct Procurements	Administer Procurements	Close Procurements

Processes without major outputs:

- ✓ Perform Quality Assurance, Manage Project Team, Distribute Information, Manage Stakeholder Expectations

Reserve Analysis is a T&T for (where there is a Risk component):

- ✓ Estimate Activity Durations, Estimate Costs, Determine Budget, Monitor & Control Risks

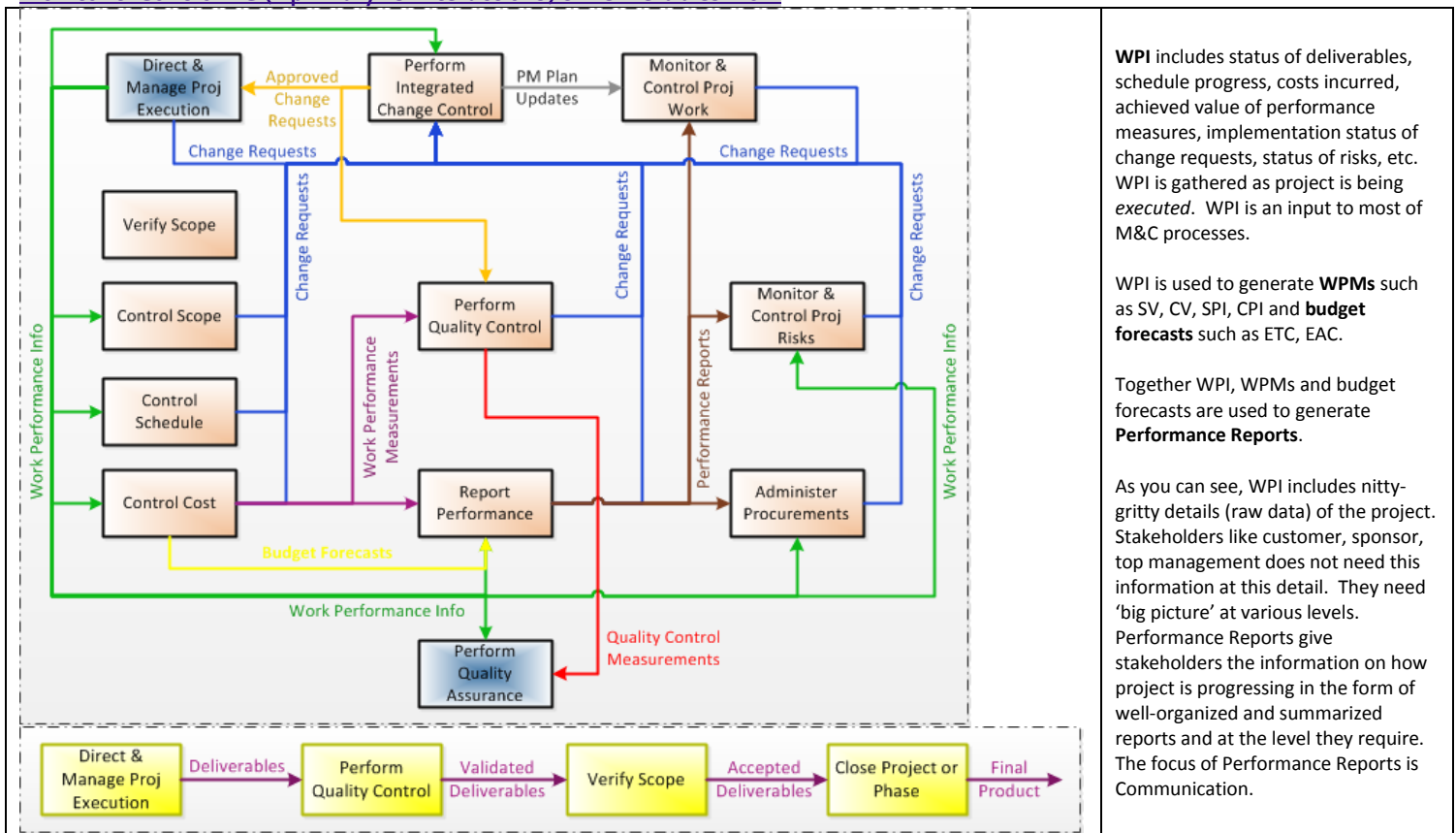
Audits are a T&T for:

- ✓ Perform Quality Assurance, Monitor & Control Risks, Administer Procurements, Close Procurements

Issue Log is

- ✓ I/p & O/p for *Manage Stakeholder Expectations*; and T&T for *Manage Project Team*

Monitor & Control PG (– primary IO interactions) & Deliverables Flow



Summary Definitions of Processes in each of 9 KAs**INTEGRATION – (6)**

Develop Project Charter: The process of developing a document that formally authorizes a project or phase and documenting initial requirements that satisfy the stakeholder's needs and expectations.

Develop Project Management Plan: The process of documenting the actions necessary to define, prepare, integrate and coordinate all subsidiary plans. The PM plan becomes the primary source of information for how the project will be planned, executed, monitored & controlled, and closed.

Direct and Manage Project Execution: The process of performing the work defined in the project management plan to achieve the project's objectives.

Monitor and Control Project Work: The process of tracking, reviewing, and regulating the progress to meet the performance objectives defined in the project management plan. Monitoring includes status reporting, progress measurement, & forecasting. Performance reports provide information on the project's performance with regard to scope, schedule, cost, resources, quality & risk, which can be used as inputs to other processes.

Perform Integrated Change Control: The process of reviewing all change requests, approving changes, and managing changes to 1. the deliverables, 2. organizational process assets, 3. project documents, & 4. the project management plan.

Close Project or Phase: The process of finalizing all activities across all of the project mgmt PGs to formally complete the project or phase (by getting the final acceptance / sign-off from the customer).

(5) – SCOPE

Collect Requirements: The process of defining and documenting stakeholders' needs to meet the project objectives.

Define Scope: The process of developing a detailed description of the Project & Product. It turns all requirements into a more detailed project scope stmt.

Create WBS: The process of subdividing project deliverables and project work into smaller, more manageable components.

Verify Scope: The process of formalizing acceptance (by customer) of completed project deliverables.

Control Scope: The process of monitoring the status of the project and product scope and managing changes to the scope baseline.

TI (6) ME

Define Activities: The process of identifying the specific actions to be performed to produce the project deliverables. WPs >> Activities (work necessary to complete WPs).

Sequence Activities: The process of identifying and documenting relationships among the project activities.

Estimating Activity Resource: The process of estimating the type & quantities of material, people, equipment, or supplies required to perform each activity.

Estimating Activity Duration: Process of approximating the number of work periods needed to complete individual activities with estimated resources.

Develop Schedule: The process of analyzing activity sequences, durations, resource requirements & schedule constraints to create project schedule. It determines the planned start & finish dates for project activities & milestones.

Control Schedule: The process of monitoring the status of the project to update project progress and managing changes to the schedule baseline.

(3) – COST

Estimate Costs: The process of developing an approximation of the monetary resources needed to complete project activities.

Determine Budget (Cost Performance Baseline): The process of aggregating the estimated costs of individual activities or work packages to establish an authorized cost baseline.

Control Costs: The process of monitoring the status of the project to update the project budget and managing changes to the cost baseline.

(3) – QUALITY

Plan Quality: The process of identifying quality requirements and/or standards for the project and product, and documenting how the project will demonstrate compliance.

Perform Quality Assurance: The process of auditing the quality requirements & the results from quality control measurements to ensure appropriate quality standards and operational definitions are used.

Perform Quality Control: The process of monitoring and recording results of executing the quality activities to assess performance and recommend necessary changes.

(4) – HUMAN RESOURCE

Develop Human Resource Plan: The process of identifying and documenting Project Roles, Responsibilities & Required Skills; Reporting Relationships; and creating a Staff Management Plan.

Acquire Project Team: The process of confirming human resource availability and obtaining the team necessary to complete project assignments.

Develop Project Team: The process of improving the *competencies, team interaction, and overall team environment* to enhance project performance. "Project Management Skills, Leadership Styles, Power, Team Building and Motivation of people are all concepts that fall into this process."

Manage Project Team: The process of tracking *team member performance*, providing feedback, resolving issues, and managing changes to optimize the project performance.

COMMUNICATIONS – (5)

Identify Stakeholders: The process of identifying all people or organizations impacted by the project and document their interests, involvement and impact on project success.

Plan Communications: The process of determining the project stakeholder information *needs* & defining a communication *approach*.

Distribute Information: It is the process of making relevant information available to project stakeholders as planned. Execution of Communication Management Plan, as well as responding to unexpected requests for information. Bulk of Project Communication takes place here.

Manage Stakeholder Expectations: It is the process of communicating and working with stakeholders to meet their needs and addressing issues as they occur.

Report Performance: It is the process of reporting to the stakeholders, how the project is progressing against the plan. It involves collecting and disseminating Project Information, Communicating Progress, Utilization of Resources and Forecasting Future Progress and Status.

RI (6) SK

Plan Risk Management: The process of DEFINING HOW to *conduct risk management activities* for a project. In Plan Risk Management, the remaining FIVE risk management processes are PLANNED (creating a road map for them) and HOW they will be conducted is documented.

Identify Risks: The process of determining WHICH *risks* may affect the project and documenting their characteristics.

Perform Qualitative Risk Analysis: The process of PRIORITIZING *risks for further analysis or action* by assessing and combining their probability of occurrence and impact. It is a SUBJECTIVE ANALYSIS.

Perform Quantitative Risk Analysis: The process of NUMERICALLY ANALYZING the *effect of identified risks* on overall project objectives. Overall project risk exposure; and initial COST & SCHEDULE reserves are determined.

Plan Risk Responses: Process of DEVELOPING OPTIONS & ACTIONS to *enhance opportunities & to reduce threats* to proj objectives.

Monitor and Control Risks: The process of IMPLEMENTING *risk response plans*, TRACKING *identified risks*, MONITORING *residual risks*, IDENTIFYING *new risks*, and EVALUATING *risk process effectiveness* throughout the project.

(4) – PROCUREMENT

Plan Procurements: The process of documenting project purchasing (make-or-buy) decisions, specifying the approach, and identifying potential sellers. (How, What, How Much and When).

Conduct Procurements: The process of distributing procurement docs, *obtaining seller responses*, evaluating bids & *selecting seller/s*, and *awarding a contract* to the selected seller/s.

Administer Procurements: The process of *managing procurement relationships, monitoring contract performance, and making changes and corrections* as needed.

Close Procurements: The process of completing each project procurement.

Acknowledgements

1. PMBOK Guide 4th Edition from PMI
 2. PMP Exam Prep by Rita Mulcahy
 3. PMP Exam Study Guide by Kim Heldman
 4. PMP Exam In Depth by Paul Sanghera
 5. Head First PMP
 6. <http://www.deepfriedbrainproject.com>
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