PM Notebook

Summarizing Project Management Concepts for the PMP Exam

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Road to PMP

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No great man ever complains of want of opportunity.
Ralph Waldo Emerson

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APPENDIX E – ESTIMATING TECHNIQUES

3-Point Estimates

Uses 3 estimates – **Optimistic (O), Most-likely (M), and Pessimistic (P)**

Simple/Triangular Distribution

Used infrequently.

$$E_{SA} = \frac{(O + P + M)}{3}$$

Beta Distribution / Weighted Average / PERT (Program/Project Evaluation Review Technique)

More commonly used technique.

Formula

$$\Sigma = \frac{(O + P + 4M)}{6}$$

Sigma / Standard Deviation

Characteristics

- It indicates the degree of variation from the average (mean.)
- Indicates the standard error in the estimate and provide the idea of accuracy.
- The larger the standard deviation, the larger the risk in the estimate.

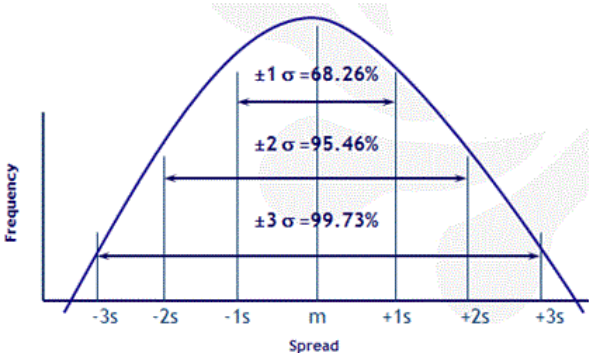
Formula

$$\sigma = \frac{(P - O)}{6}$$

Details

- **± 1 Sigma –** Equals **68.27%** which means approximately **317,300 of 1 million** items will have problems.
- **± 2 Sigma –** Equals **95.46%** which means approximately **45,400 of 1 million** items will have problems.
- **± 3 Sigma –** Equals **99.73%** which means approximately **2,700 of 1 million** items will have problems. **This is the common standard deviation.**
- **± 6 Sigma (Six Sigma) –** Equals **99.9999998%** which means that less than **1.5 out of 1 million** items will have problems.

Normal Distribution Curve



Beta Variance

Variance of an activity = Sigma squared.

$$\mathrm{VAR}_{\mathrm{PERT}} = \sigma^2 = \left(\frac{(\mathrm{P}-\mathrm{O})}{6}\right)^2$$

Path Standard Deviation

You can calculate a path's standard deviation by –

1. Calculating standard deviation of each activity.
2. Deriving variance from the standard deviation of each activity.
3. Cumulating all variances.
4. Deriving overall standard deviation from the cumulated variance.

				(O+4M+P)/6	(P-O)/6	POWER(SD,2)
Activity	**Optimistic**	**Most Likely**	**Pessimistic**	**PERT Estimate**	**SD**	**Variance**
Activity 1	12	15	24	16.0	2	4
Activity 2	8	9	14	9.7	1	1
Activity 3	15	19	27	19.7	2	4
Activity 4	10	14	28	15.7	3	9
Activity 5	17	20	35	22.0	3	9
Total				**83.0**		**27**
					Overall SD = SQRT(VAR)	**5.20**

Other Estimating Techniques

Analogous Estimating / Top-down Estimating –

- Relies of **historical data** from a similar activity or project.
- High-level estimates. Not based on detailed data.
- Form of **expert judgment**.

- Less time, and less accurate.

Bottom-up Estimating – Breaking down complex activities into pieces, and working out the resource assignments for each of those simpler pieces.

- Requires a fully decomposed WBS.
- **Very time consuming, most expensive, yet most accurate.**
- Completed with project team.

Definitive Estimate – One of the most accurate. **Very late** estimate associated with **bottom-up estimating**. You need the WBS in order to create the definitive estimate. The range of variance for the estimate can be from **–5% to +10%**.

Heuristics – Generally accepted rules, best practices, or simple the **rule of thumb**. E.g. Design work is always 15 percent of the total project length.

Historical Relationships – Those are the parameters for **parametric** and **analogous** estimating. Information that affect the estimates –

- **Accuracy** of historical information.
- **Quantifiable** parameters.
- **Scalable** models.

One-Point Estimating – To submit one estimate per activity.

- Forces people into padding their estimates.
- Hides important information about risks and uncertainties.
- Often results in the estimators working against the PM to protect themselves.

Parametric Estimating – Using algorithms on **historical data** and **project parameters**. Examples are cost per yard, cost per unit, dollars per module, etc.

- **Adjustment Factor –** An additional parameter. E.g. cost per unit plus the delivery.
- **Regression Analysis**
- **Learning Curve –** An approach that assumes the cost per unit decreases the more units workers complete, because workers learn as they complete the required work. Specifically, each time output doubles, work hours per unit decrease by a fixed percentage (learning rate.)

Resource **cost rates** can be gathered in various ways include –

- Gathering quotes.
- Standard rates with escalation factors (for contract.)
- Commercial databases.
- Published price lists.

Published Estimating Data – Articles, books journals, etc. that collect, analyze, and publish data from other people's projects.
Rough Order of Magnitude (ROM) / Ballpark Estimate – Very early estimation of a project's level of effort and cost to complete. Happens before fully-defining scope and requirements in the **initiating process**. **Got a range of -25% to +75%.**
Scientific/Sophisticated Wild-Ass Guess (SWAG) – Rough estimate made by an expert based on an experience. Happens when there is not enough time or information to deliver exact estimate.