Monte Carlo Analysis in Project Management

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A Monte Carlo analysis is a key risk management technique that many PMP and PMI-RMP exam study books gloss over.

Most guides say it is a complex technique requiring a computer's assistance, implying that PMP aspirants do not need further detail. This assumption is not true; Monte Carlo Simulation is a straightforward technique.

Monte Carlo Analysis

A Monte Carlo analysis is a quantitative analysis technique used to identify the risk level of achieving objectives.

This technique was invented by a nuclear scientist named Stanislaw Ulam in 1940; it was named Monte Carlo after the famous casino city in Monaco.

A Monte Carlo simulation is a mathematical technique that allows you to account for risks in decision-making. It helps determine the impact of identified risks by running multiple simulations and finding a range of outcomes.

Every decision has a degree of uncertainty, and the Monte Carlo simulation helps you make decisions in such situations. It allows you to make sound choices and avoid surprises in later stages. You can run this simulation to analyze the impact of the risks on cost, schedule estimates, etc.

You get a range of possible outcomes and probabilities for any course of action.

Monte Carlo Analysis Example

Let's discuss an example using Monte Carlo analysis when creating the project schedule. Suppose that you have three activities with the following duration estimates (in months):

Activity	Optimistic	Most Likely	Pessimistic	PERT Estimate
A	4	5	6	5
B	5	6	7	6
C	6	7	8	7
Total	15	18	21	18

According to the PERT estimate, you can complete these activities in 18 months.
In the best case, it will only take you 15 months, and in the worst, 21 months.
Now, if we run the Monte Carlo simulation for these tasks 500 times, it may show the following:

Duration (in months)	Chances of Completion
15	1%
16	2%
17	8%
18	55%
19	70%
20	95%
21	100%

This data **is for example purposes only, not from an actual simulation**.

- 1% chance of completing the project in 15 months
- 2% chance of completing the project in 16 months
- 8% chance of completing the project in 17 months
- 55% chance of completing the project in 18 months
- 70% chance of completing the project in 19 months
- 95% chance of completing the project in 20 months
- 100% chance of completing the project in 21 months

This technique provides a more in-depth data analysis, allowing you to make a better-informed decision.

Limitations of the Monte Carlo Analysis

- The Monte Carlo analysis has a few limitations, for example:
- The results depend on the quality of estimates, so if the data are biased, you will get a false result.
- The Monte Carlo analysis shows the probability of completing the tasks, not the actual time required.
- This technique is not useful for a single activity; you must have several and have risk assessments completed.
- You will need to buy an add-on or a software program to run the Monte Carlo simulation.

Benefits of the Monte Carlo Analysis

This method has many benefits in project management, such as:

- It helps you evaluate the risk of the project.
- It helps you predict the chances of failure in schedule and cost overrun.
- It converts risks into numbers for easy assessment.
- It helps you build a realistic budget and schedule.
- It helps you gain management support.
- It helps you in decision-making with objective evidence.
- It helps you to find the chances of achieving project milestones or intermediate goals.

The Monte Carlo analysis is an essential. technique in risk analysis that helps you make decisions under uncertain conditions. Although it is often not used in projects, it increases the chances of achieving project success within the approved project baselines when applied.