



## Case Study – Cost Contingency Determination during Major Projects Business Case Development Phase

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**Abstract:** Contingencies for risk are an aggregate value made up of threats (which may add cost) and opportunities (which may reduce cost). In preparing estimates for capital works, it is also important to recognise that there are many situations where the inputs to the cost estimate are variable i.e. they may be less than or greater than that estimated.

A cost contingency allowance is the measure of the residual risks that exists with the project relative to achieving the Project Objectives and is expressed as a level of uncertainty or confidence. A key element of the cost estimate is the inclusion of a realistic contingency allowance. The two basic requirements to establish a contingency allowance are:

- What is the risk profile of the project?
- What level or probability of risk occurring should be allowed for in the contingency?

Once these two requirements have been determined the contingency allowance can be estimated by using an appropriate Quantitative Risk Analysis (QRA) approach. QRA techniques provide a numerical estimate of the overall effect of risk on the project objectives that results from the combined effect of all risks/opportunities and their potential interactions with each other.

Usually QRA techniques being grouped in two key methods:

- Deterministic Methods
- Probabilistic Methods

While deterministic methods being widely used across different sectors, for most major projects the probabilistic methods of contingency assessment is recommended wherever possible as the process of conducting this type of assessment provides the opportunity to discuss and document the risk with relevant stakeholders and agree the appropriate quantum and probability for each risk item.

A good example of these probabilistic methods is the application of Monte Carlo Simulation (MCS) technique that permits the combination of probability distributions of line-item costs or schedule activity durations, many of which are uncertain. MCS is a detailed, computer-intensive simulation approach to determining the value and probability of possible outcomes of a project objective such as a project schedule or project total cost estimate.

Schedule Risk Analysis (SRA) captures the risk and uncertainties that schedule durations may increase from technical challenges, lack of qualified personnel, lower productivity rates and resource uncertainties to perform the work. SRA examines the effect of activities and events slipping on a project's critical path through the Schedule Model. Through a similar approach, Cost Risk Analysis (CRA) examines the uncertainties and risk events to the project and specifies how they may affect the project costs. The main purpose of CRA is to capture uncertainty in cost estimate methodology, technical parameters, schedule uncertainty, and programmatic factors in order to move the deterministic point estimate to a probabilistic estimate.



This presentation will discuss the above mentioned processes and tools used in determination of contingency allowance for a recent multi-billion major project case study in Australia. It will also present audience how the undertaken approach could provide the project team with additional results including the relative importance of each risk in determining the overall project cost and schedule for their effective and efficient decision making.

*Keywords:* contingency, business case development, probabilistic estimation, schedule risk analysis, cost risk analysis



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