

## White Paper 2024-06

### Managing Contingency and Uncertainty During Early Project Estimates: How Contingency Calculation Is Different Before and After the Final Investment Decision

*During a project development phase, estimating uncertainty will typically decrease as project maturity increases. At the same time, the estimates will include some contingency. What are the expected levels of uncertainty and contingency, and how to evaluate them in a mutually exclusive manner? Why is the approach different from the project execution phase? This White Paper delves into more detail on the issue of contingency and uncertainty evolution during project development, and the differences with project execution.*

#### Uncertainty and contingency

In our White Paper [2023-03 'How to Avoid Underestimating Cost Expectations during Project Definition Phase for Owners'](#), we have already covered the subject of avoiding the deception that base estimates will tend to increase as the project definition matures because of more detailed knowledge of the final product and of the execution strategy. Therefore, the uncertainty levels associated with estimates are related to an increasing base estimate level. The following graph reproduced from this White Paper summarises the observation.

**The basis of calculation of contingency is different during the definition and the execution phases**

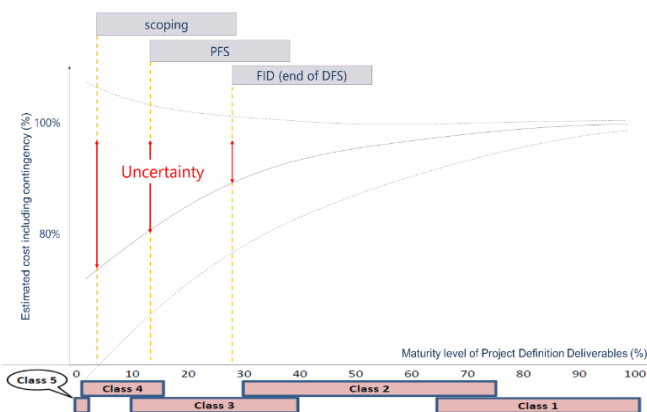
base estimate. Uncertainties should decrease to a manageable quantity at Final Investment Decision (a target is typically to reach an order of magnitude of 10% at this stage). Because of the observation related in the introduction to this paper, in terms of project financing or business plan, the owner should consider from the start a project cost including uncertainties.

During project definition, contingency is issued from an analysis of discrete opportunities and risks and needs to be exclusive of the elements included in the uncertainty. Risks then need to be specific events associated with probabilities that are considered useful

for consideration, based on experience.

It is important that the elements included in both uncertainties and contingency are mutually exclusive, to avoid double dipping. For example, having to redo some part of the work during the project execution due to a quality issue is a risk; the quantities associated with this piece of work will be an uncertainty that will be progressively narrowed down as preliminary design progresses. It may require some careful analysis to check the mutually exclusive nature of both amounts and avoid excessive double-dipping. This may not always be straightforward, and rules may need to be defined upfront accordingly as part of the organisation standards to split between uncertainty and contingency. For example, productivity risks can be considered either way depending on the situation, and this needs to be clarified as a standard.

As a result of this principle, it appears quite inappropriate during the definition phase to determine contingency based on a standard percentage. Contingency should be justified by a risk register where it can be checked that the risks exclude uncertainties. In one of our recent projects, at the end of the scoping phase the owner was considering a standard 25% contingency, and 50% of uncertainty on top. This was probably too conservative, because the risk register could only justify a more normal contingency of less than 10% of the estimate when excluding aspects normally addressed as part of uncertainties.



In this view, the base estimate contains an amount of contingency to cater for the known-unknowns, risks identified as part of the project risk analysis. On several occasions with clients we have identified some confusion between contingency and uncertainty elements and this is the origin of this White Paper.

#### How to segregate risks and uncertainties during development phase

Uncertainties are related to project maturity. They cover uncertainties on costing of items, durations of operations, quantities, as well as unidentified scope and equipment that will be progressively identified and included in the

## Why contingency is calculated differently during execution phase

During the execution phase post Final Investment Decision, the forecast at completion includes a contingency element. Quantity allowances still remain included to address design maturity based on benchmarks, but no uncertainty is considered separately. If a management reserve is set, it is to address unknown-unknowns. The base estimate should at this stage be based primarily on actual quotes received from contractors and suppliers, including to estimate quantity allowances.

At this stage, project contingency can be calculated by considering discrete risks as well as more general risks on cost line items for example as part of a Monte Carlo analysis where the potential variations of each line are considered, which can include an element of uncertainty. Another part of the uncertainty is treated through allowances included in the base estimate, which are based on lessons learned from other projects (for example, typical quantity growth during detailed engineering phases, or allowance between engineered quantities and quantities to be purchased).

In reality, the basis for the calculation of contingency will be different from the development phase because the inclusion of general uncertainties in the calculation, whereas they are excluded during the development stage. This may lead the contingency value for the project baseline budget to be higher than what was reported at the preparation of the final investment decision, where uncertainties were usually considered separately. This aspect must be carefully managed in terms of management expectation to explain clearly that there is a change in the basis of contingency calculation, otherwise the baseline contingency may be lower than what would effectively be calculated using project execution assumptions, and the project may not be sufficiently protected against unexpected events.

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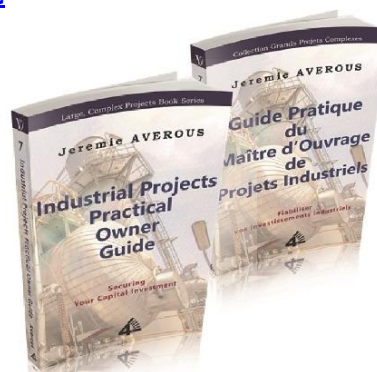
## Summary

During the project development phase, the uncertainties need to be considered carefully, based on experience, to ensure that expectations are managed as to the final estimate at Final Investment Decision. The contingency element included in the base estimate must be focused on identified risks, and the uncertainty element estimated separately based on project development stage and benchmarks.

When in execution phase, contingency generally includes both elements of discrete risks and more systemic risks and uncertainties, therefore the basis of calculation will change. This is not always fully understood and needs to be carefully communicated to the decision-maker to make sure the project remains well protected against unexpected events.

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