

Contingency Reserve and Uncertainty

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Overview

This whitepaper discusses the importance of, and clarifies Uncertainty and the Funding Reserves required to provide a complete Project Budget that enhances success.

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Introduction

Risk management appears to be a mature process in the finance and insurance industries. Both of these industries tend not to make decisions to loan money or to provide insurance products unless detailed risk assessments are made. New insurance products for example, are not even created without the ability to quantify risk.

Is the project management profession just as mature on risk management? Do projects proceed based on their risk profile? Applying a concerted effort to understand risk can mean the difference between project success and failure. Many projects commence risk management but often stop after the Identification and Evaluation step. Quantification and subsequent funding is often not provided for ongoing risk management and this can be fatal to project success. Typical funding practices often provide for an Estimate +/- a percentage to cover all areas of uncertainty. Is this sufficient?

To begin the risk quantification process so that funding reserves can be developed, it is important to clarify the definitions so that it is easier to request and justify the level of funding required from Sponsors, Project Owners or Finance departments. Risk is only one type of uncertainty to a project and is not the only thing to consider during quantification for funding reserves.

Types of Uncertainty

There are three main areas of uncertainty related to managing a project: Variance, Foreseen and Unforeseen Uncertainty. Variance relates to the uncertainty within the estimate of an activity. The estimate is typically identifiable and uncertain within a range of confidence. Subject matter experts, when estimating their activities, are going to provide a worst and best case scenario, order of magnitude or a 3 point estimate in relation to the duration, cost and performance levels. This range is the Variance. For example 'Requirements gathering to take between 6 and 8 weeks'.

Foreseen Uncertainty equates to identifiable, but uncertain (known unknowns), influences, variables or events, typically known as Risks and managed formally throughout the project, ideally under a documented framework. Foreseen Uncertainties or Risks require Contingent plans to be developed, and have Treatment plans in the short term to reduce likelihood or impact. For example, the

number of people required for a clinical trial to be valid may not be reached within the timeframe available.

Unforeseen Uncertainty is usually not formally identified, is generally not anticipated (true unknown unknowns) and often just referred to as Uncertainty. An example of Unforeseen Uncertainty could be not anticipating that asbestos would be found within walls in a house less than 10 years old, requiring specialised removal.

For ease of terminology these three areas of uncertainty will be, from here on, referred to as Variance, Risk and Uncertainty.

But what of reserves? Surely this is straight forward? It is agreed from most industry sectors that a reserve fund needs to be established that is over and above the raw project estimate, but the titles and how to approach their development or what they are used for, varies across and within organisations.

Reserve Titles

The Project Management Institute (PMI) through the PMBoK provides for two types of reserves titled as Contingency Reserve (CR) for changes resulting from planned Variances and Risks (known unknowns). The other is Management Reserve (MR) for change resulting from unplanned Variances, Risks or Uncertainty (unknown unknowns). In a project environment, CR is considered part of the project baseline and managed by the Project Manager, MR outside it and typically managed by the Sponsor or Steering Committee.

In a government contract environment these two titles can be reversed and this is evidenced in the US Government Accounting Office (GAO) guidelines on Cost Estimation for example. These guidelines provide for Management Reserve to be inside the project budget, but outside the project baseline and managed by the Project Manager. Contingency Reserve is typically held and managed by the Contracting Agency of the government.

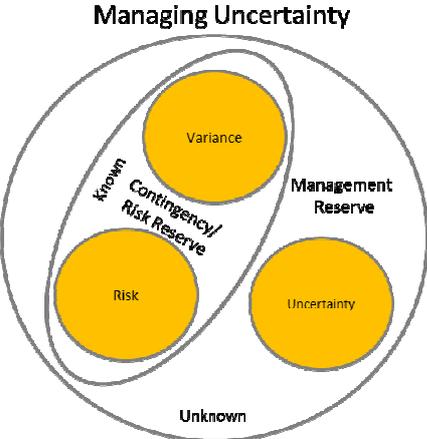
The Office of Government Commerce in the UK, through Prince2, heads in a different direction and refers to Tolerances at the project, stage and work package levels.

The Association for Project Management refers to a Contingency Budget, simply as the amount of

money required to implement a Contingency Plan. Management Reserve is defined by them as a central contingency pool for risk management.

Despite all these titles that are from various global standards and guidelines, the most common theme is to provide for two funding reserves to manage uncertainty. The first is the Contingency or Risk Reserve for known Variance and Risk. The second is the Management Reserve for Uncertainty, the true unknown unknowns.

The following diagram summarises the relationship between these two funding reserves in relation to uncertainty:



Who manages these two reserves also varies across organisations. It can vary if the project is outsourced or vary depending on the delegation structure within an organisation. Politics can also have an effect.

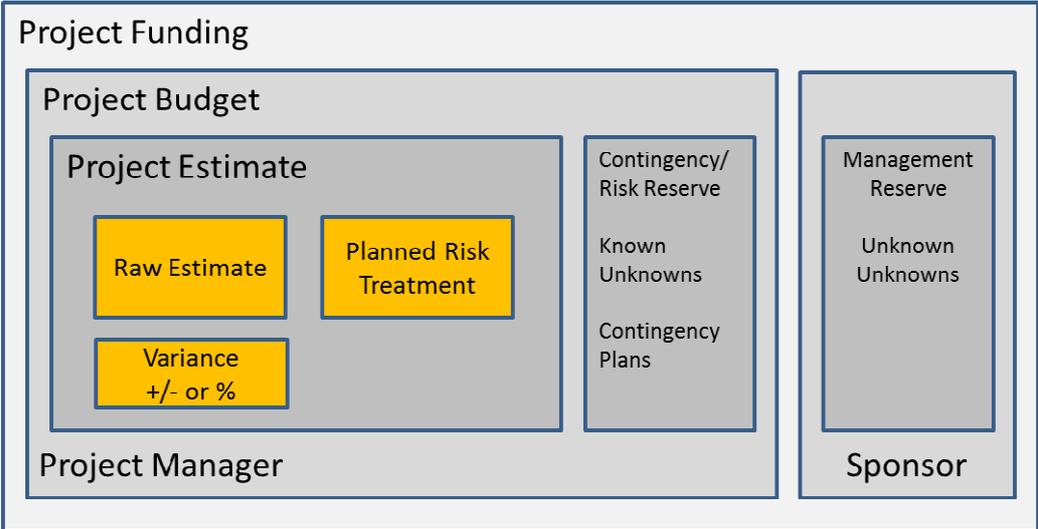
Reserve Management

In a project environment, there becomes three key terms relating to project funds. The first is the Project Estimate. Not only does it include the Variance factored into it from activity estimation, but also may contain the estimation for planned risk treatments that will be performed as part of delivery of the project. These planned risk treatments may or may not be listed separately from the activity estimates.

Outside the Project Estimate is the Project Budget, the second funding term. This includes the Project Estimate and the Contingency/Risk Reserve. The Project Budget is the performance baseline for cost measurement of the project.

The Contingency/Risk Reserve provides funds for dealing with Risk Realisation and Variance changes. The final term is the Project Funding, which includes the Project Budget with the Management Reserve determined by the Sponsor or Organisation for covering Uncertainty.

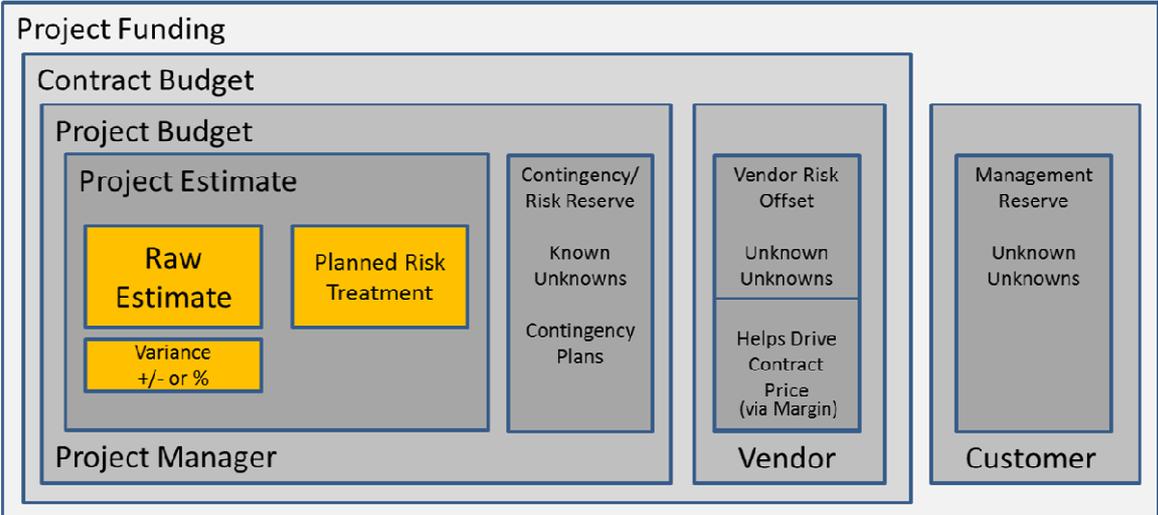
The following diagram summarises the typical project level funding within an organisation and which role is typically managing it:



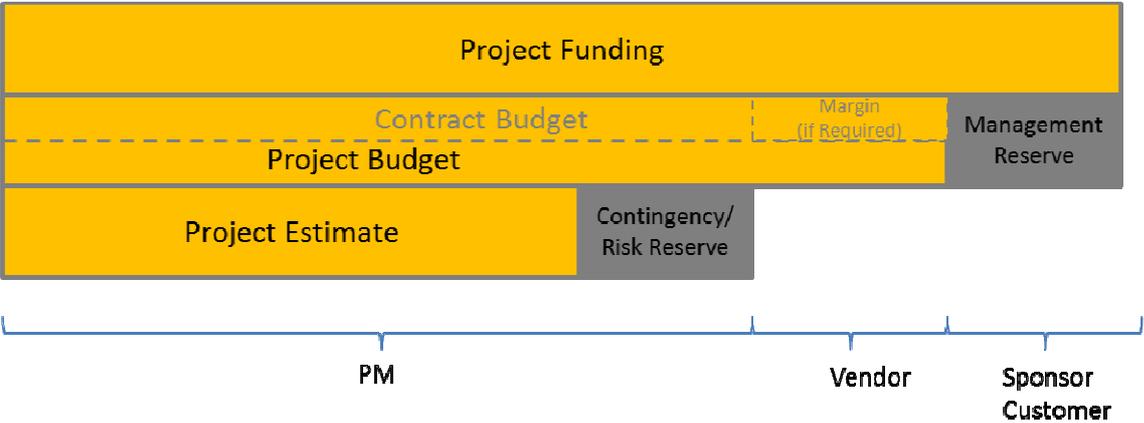
In a contracting or outsourcing environment, additional risk factors involving profitability and contract penalties are now considered. In addition to the Project Budget, there is a Contract Budget that is typically determined by providing for some Uncertainty that is factored into the price to help

the Vendor offset risks associated with the contract, i.e. the Offset reserve required helps drive the price of the contract budget via the margin that is required. The customer would still hold their Management Reserve for the total Project Funding.

The following diagram shows the Vendor situation in relation to Project funds and who is typically managing it:



A quick visual summary of reserve management is as follows:



All of the standards discuss the importance of ensuring that reserves exist at all levels of project funding for managing all types of uncertainty. Quantitative analysis is the recommended technique to justify the level of funding required.

Quantitative Analysis

Quantitative Analysis is the process of providing a numerical analysis to the impact of identified risks

on the project outcome. This analysis provides an objective basis to justify the value of reserve funding.

When considering the likelihood and impact, it is not enough to take a subjective selection from a matrix, but to evaluate each risk individually, quantify them and consider the use of a matrix as a summary of the analysis.

Quantifying at a minimum is going to require a list of the consequences (provides impacts) and causes (points to likelihood) of the risk. These lists are going to provide detailed information on what could be done to remove a cause, and its cost to do so, and provides the contingency plans and costs to deal with consequences when/if the risk realises. Once the list is quantified, a probability distribution can be used to determine a reasonable reserve amount.

There are many techniques and the ISO 31010 Risk Management-Risk Assessment Techniques certainly provides a comprehensive starting point when looking for analysis techniques that provide quantitative output.

It is important to understand that some techniques do not make sense at a project level because there are insufficient events for statistical or quantitative analysis. These techniques are better suited to a Portfolio of projects where combining all the risks across an organisation will provide the valid statistical base from which to calculate.

Contingency/Risk Reserve for Variance

A value for Variance typically involves quantifying the best and worst case scenarios, order of magnitude ranges or 3 point estimates. Taking the most conservative or worst case as justification for inclusion to the Contingency/Risk Reserve value. For example, if an estimated range is given for an activity of \$500 to \$1000, the raw estimate could be some midpoint like \$750 and the difference to the worst case of \$1000 of \$250 would be included in the Contingency/Risk Reserve.

The quantification of Variance, at a minimum, needs to be a mandatory inclusion in the Contingency/Risk Reserve. It can be managed separately to Risk value or included in a risk such as 'Insufficient Estimate'.

Contingency/Risk Reserve for Risk

When looking to develop a Contingency/Risk Reserve to manage Risk, it can be difficult to know where to start. The PMI, through the PMBoK, provides three basic approaches to determine the reserve value for Risk; that being to calculate based on a percentage of the estimate, a fixed amount or through quantitative analysis.

While the first two approaches have appeal, they will not suffice in a contract environment and can

be open to being rejected when there is an inability to justify the percentage or fixed amount used.

Percentage and Fixed amount approaches do have their place in the very early stages of budget estimation, however as project funding approval becomes imminent; the more robust method of quantitative analysis will provide better justification for the budget estimate.

Management Reserve for Uncertainty

With Variance and Risk being much easier to quantify, dealing with Uncertainty can be cause for some disquiet. Where to start can seem daunting. Research and history appears to be the best starting point in this situation.

Researchers like Wirth (1996) started providing an Uncertainty profile from different industry projects through the gap of the original budget values and final costs/time with team complexities. Those deviations could be used to establish an Uncertainty rating on a current project. Later in 1999, Turner, in his book on project based management, categorised projects by their level of Uncertainty based on the detail of the goals and work methods.

In their framework for project management under uncertainty, De Meyer et al (2007) also suggest reviewing internal project history to determine trends in Uncertainty, reviewing stakeholder history, for example, to understand stakeholder resistance that has occurred. De Meyer et al (2007) also provide project management styles to assist in the management of uncertainty types.

Uncertainty profiles can provide a basis to justify a probability value against the project estimate in which to establish a Management Reserve value.

It is important to realise that Management Reserve can also be calculated or used for items unrelated to Uncertainty, Risk or Variation, such as New or Unplanned Scope Changes and is typically calculated from the Cost/Benefit Analysis. The reserve value allocated for these items could be the revenue or savings difference from the total project cost.

Conclusion

Through the quantification of Variance and Risks and developing an Uncertainty profile, the provision of a reserve to manage all types of uncertainty becomes justifiable and means that projects stand a greater chance of success. Without it, forecasts are unlikely to be met.

Maybe this suggests we need to focus future estimation improvement efforts to always include reserves for the management of uncertainty as suggested by global standards.

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