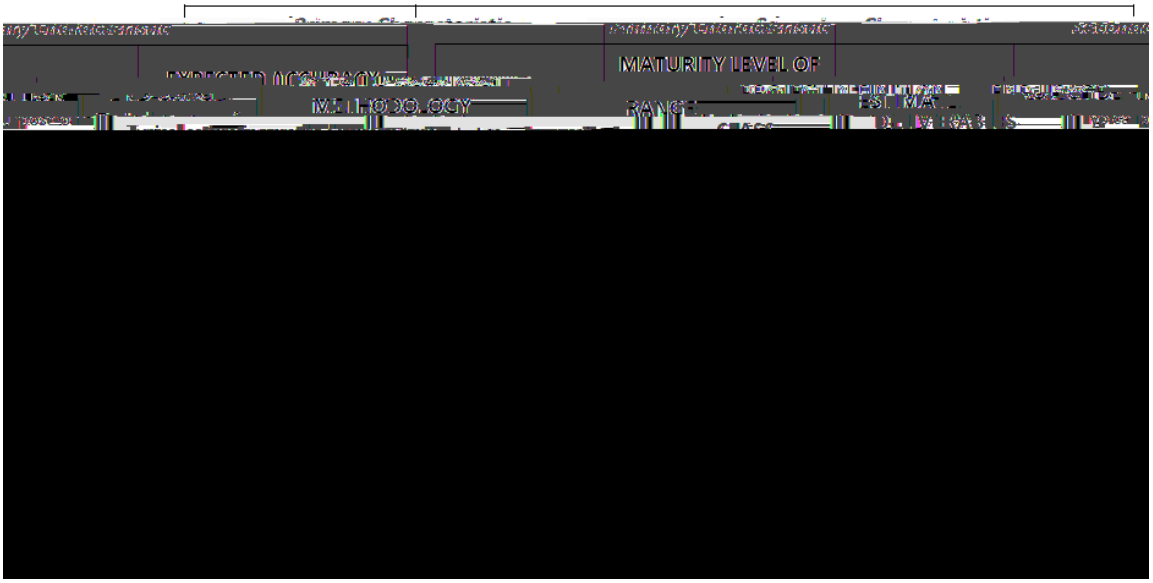

Capturing the full scope definition requires an appropriate and reasonable schedule and allows adequate time to support building in quality instead of inspecting quality. Finishing a project on time using the right schedule will help minimize risks and reduce cost overruns. This is part of the AACE's Total Cost Management philosophy and classifying schedules like cost estimates aligned with the typical Phases and Stage-Gates defines the project life-cycle.

with fixed price contracts shifting performance risk to the Contractor and cost reimbursable contracts accepting risk by the Owner.

With fixed price contracts, there must be adequate competition in order to make the proposals effective, and cost and pricing information must be available. The Contractor in a fixed price contract will accept a price which represents assumptions of a reasonable apportionment of risk. This means that the Contractor must be able to estimate uncertainties in contract performance, as well as fully understand the contract scope. Less than fully mature scope definition in drawings will increase costs at bid and increase change management efforts, resulting in higher change costs.

Cost reimbursable contracts are used when the uncertainties of performance do not6.6 (rt)1.ot6.6 (rt)1.e e a.2 (t)-3 (d)13

Another place where Owners can protect themselves against performance risks is by using language to limit or prevent the possibility of a Contractor pursuing a compensable extension of time based on an early completion schedule. Case law suggests that a Contractor has a right to finish early, so if he bids a project and reduces the costs by planning to finish in less time than the contractual completion date (CCD), he could earn extended general conditions if the Owner causes a delay beyond the Contractor's early completion date and the CCD. There are a number of clauses that protectos[.7 2 (e a)2j.9 01 Tw Ci31 (it)-3 -1.315 T

of control that the Owner accepts over the project. Risk and control are inversely related so one way to reduce risk is to choose a project delivery method that lowers Owner's risk but also gives up more Owner's control.

This risk profile is illustrated in a CMAA chart shown in Figure 2 below, which lists the range for Public-Private-Partnerships (P3), a similar delivery method as DB except for financing and operations by the Contractor, DB, DBB, CMAR, and Multiple Prime contracts, which place the risk of contract coordination onto the Owner.

The choice of project delivery method also depends on the level of scope definition. A DBB project cannot be utilized if the scope definition is not very mature or change management will exceed contingencies for time and budget. On the other end of the scale, attempting to provide too complete of a scope definition for a PPP project will reduce flexibility and limit the innovation freedom to control risks that is at the very heart of this type of delivery.

Each type of prot doill e6 (o)7.2 (ner)3.7 (o)-38 ( )10.6 (m)144 (e)10.9 (th)5.3 (o)-3.6 (tc)1.1 (e)10.7(s)12.5 (oa)2.7 (y)-1.5

of changes, establishing the types of change so appropriate funding planning can be provided. Some changes are issues that occur in most projects, such as unforeseen conditions, and some are issues that cannot be easily anticipated, such as scope changes by end-users. Planning for defined categories of changes allows alignment between categories and funding.

After all, that is the real root of the matter, if legitimate change happens and there is a fund set up to accommodate the change, there is no impact to the project. Once the categories of change are established (and many contracts as well as AACE RPs offer definitions), it is possible to plan for how to fund the changes when they occur. Looking at two broad funding approaches, Contingency and Management Reserves, the difference in the use is that Contingency is intended to be used for changes that are expected to happen even if the extent is not known, and Management Reserves are intended to fund scope requests that are not included in the original scope description, and hence the budget, from the Owner, End-User, A/E.

AACE defines Contingency, in the Cost Engineering Terminology RP, as "

."[vii] Contingency does not include major scope changes, Force Majeure events, management reserves, escalation and currency changes.

Contingency can be carried in the original budget, and during the Stage-Gate process of Project Controls, can be subdivided into specific categories such as Design Contingency, Estimating Contingency, Procurement Contingency, Construction Contingency. Note that not all contingency funding is due to specific risk events, some is needed for accommodating the standard of care in the construction process, from design to estimating to construction. There is some level of design errors and omissions that falls outside the industry standard of care which recognizes that scope definition in the way of plans and specifications cannot be perfect. This is part of the purpose of Contingency.

AACE defines Management Reserves, in the Cost Engineering Terminology RP, as "

." This is where an Owner would normally fund the items not included in Contingency, such as scope change. Management Reserves would typically be carried outside the project, and managed by the Program Manager or Owner, not the Project CM team. The better the definition of these terms, the easier it is to manage and account for change orders.

Estimating Management Reserves is more difficult than Contingency because this fund is designed to cover unknowns such as improvements in technology that might interest the end user to upgrade equipment that was specified in the original scope definition, is still sufficient, but not the most desired technology.

Contingency and Management Reserves cover the risks that can be planned, but a robust Change Management effort during design, procurement, and construction is important to control these risks. Use of a formal Stage-Gate process during the design phase is vital to supporting "design-to-budget" efforts. Use of a thorough review and evaluation of the procurement process improves the selection of

When it comes to change management for an existing project, providing accurate AACE Class 2 or Class 1 estimates for changed conditions is vital to evaluate the costs. Without the ability to discuss specific quantities and unit costs for changes, the Owner is at a huge disadvantage, and in negotiations, it is common to find that the subcontract portion of the general contractor's estimate that is poorly documented will be reduced in the face of a detailed check estimate. In addition, when there is a time impact from a changed condition or delay, the costs for the extended general conditions when the project is truly prolonged can be a large part of the total change order. This makes it imperative that a good process to develop independent Time Impact Analyses (TIA) in order to evaluate the contractor's TIAs, and armed with this independent evaluation, the negotiations are quicker and easier.

Once a delay or impact event has been identified, prior to absorbing (l)-2 (A)-1 (n)- i,(go)-9 (e)4.9 (s)-4g4td2.1vd2.-8.5 ()-2

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lessons. Engaging in forensic schedule and cost analysis requires a deep understanding of CPM

While part of the value of industry professional associations includes CM professionals earning industry certifications, a greater part of the value is the engagement in these associations by writing and presenting papers on various cost, scheduling, and risk topics. This engagement takes a CM professional from an expert in these fields to an industry thought leader. At this level, the professional has taken the lead in innovative approaches to managing risk and has defended those approaches from industry constructive criticism, improving the approach.

Procurement Process

Once the contract type and project delivery methods are chosen, and the appropriate risk assignment language has been selected, it is vital that the procurement process is managed with an eye to limiting risk. Many disputes start with a breakdown in procurement.

A quality check on the procurement is to evaluate the number of questions or requests for information that result from Contractors starting their cost estimate. If there are large numbers of questions, the documents do not convey the appropriate scope definition and the project contingency is likely too low as the result will be an increase in change requests. A careful evaluation of the bidders, including trade and general conditions comparisons, is vital to ensure appropriate awards. Lessons learned from claims shows that a frequent problem with projects that had cost and time overruns was an inappropriate award to the “low” bidder. This can be due to insufficient general conditions, unbalanced subcontract trade bids, inappropriate project duration estimate, missing scope, and inadequate or lack of contingency.

Constructability reviews, value planning and engineering, along with better designer quality control of documents, are valuable mechanisms to reduce risk to the Owner. Owner risk is enhanced since these same defects in scope definition will generally raise the bids from the Contractors attempting to limit their risk.

Integrated Cost and Schedule Management

Risk control attempts to predominantly avoid cost and time losses, and while these are discussed separately, they should be managed in an integrated approach with risk management. Early risk assessment identifies project or program risk issues that can then be monitored and controlled. This can start with identifying cost and risk drivers during value planning and monitoring those drivers throughout the stages of cost and schedule development in conjunction with scope definition development. Risk-based approaches to determine appropriate contingency and management reserve are

plan, and use the output or deliverables from each stage to manage the next stage. Accurate cost estimates with appropriate contingencies, developed at the appropriate level of accuracy, integrated with the evolving schedules, starts the project with the right benchmarks to monitor. With preliminary schedules established, a strong risk workshop enables the CM team to identify the likely risks, eliminate the highest priority risks by the risk response plan, and then monitor the ongoing risks to avoid or mitigate those risks during the project.

This approach takes advantage of the combined experience of the CM team and embraces risk as an integral part of the CM process such that it informs the team and helps shape the approach to managing Owner risk. These project controls discipline tasks are represented in the table below, aligned with the project phases:

Conclusion

Control of Owner risks is not a universal one-step panacea, but rather an integrated program of cost and schedule risk management that starts pre-project and does not end until all outstanding issues are resolved with the project complete. For the most effective control of Owner risk, the risk management process cannot be a one-time effort or a casual approach, but an integrated cost/schedule/risk culture embedded in the construction management process.

List of Figures