The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2020* Virtual Conference & Expo

(Subject to change – Rev. 2020-06-11)

LIVE WEBINAR! (ADV-3587) (Panel Discussion) COVID-19 and the New Normal

Author(s)/Presenters(s): James G. Zack, Jr. CFCC FAACE Hon. Life; Anthony M. Bazzini; John P. Orr, PSP FAACE; Greg M. Hall, PSP; Daniel P. Gilmour, PSP

Level: Basic
TCM Section(s): 10.3. Change Management
7.6. Risk Management
Venue: 2020 AACE International Conference & Expo

Abstract: The COVID-19 pandemic has significantly impacted the AACE community, cost engineering industry, and global marketplace over the course of early 2020. In many cases, the coronavirus has fundamentally changed the way day-to-day business is conducted. This panel discussion will be a wide-ranging conversation with industry leaders on the effects of the COVID-19 crisis and its future impact on the industry. The expert panel carries seasoned experience in the engineering, oil and gas, and construction industries and represents the perspectives of owners, consultants, and contractors. Discussion topics for the panel include the virtual workplace, force majeure and contract language, categories of operational and productivity impacts, best practices for documenting COVID-19 related delays, and organizational improvements brought on by the pandemic. Finally, the panel will field questions from the audience.

(BIM-3355) Adaptation of AACE Cost Classification System to Define BIM Uses in Infrastructure Bidding

Author(s)/Presenters(s): Stefania Limp Muniz Correa; Dominique Quitete de Barros Mansur

Level: Basic
TCM Section(s): 7.3. Cost Estimating and Budgeting
4.1. Project Implementation
Venue: 2020 AACE International Conference & Expo

Abstract: Building information modeling adoption, as well as the use of new technologies are gaining relevance in Brazilian civil construction industry, mainly at construction jobsites, where its benefits have already been proven. Given the increasing trend for developing innovation practices through infrastructure projects lifecycle, this article aims to discuss and exemplify the adaptation of AACE cost estimate classification system in order to guide building information modeling uses during the bidding stages of a Brazilian general contractor. By adopting the methodologies, it was possible to structure and
standardize bidding processes, providing better value engineering, and giving the client high-quality analysis given the use of technology.

(BIM-3543) Value+: BIM-Enabled Value Engineering Decision Making

Author(s)/Presenters(s): Ahmed Montaser, EVP; Ali Montaser, P.Eng. CCP EVP PSP

Level: Advanced  
TCM Section(s): 7.5. Value Analysis and Engineering, 7.3. Cost Estimating and Budgeting  
Venue: 2020 AACE International Conference & Expo

Abstract: The use of value engineering (VE) in the construction industry has grown significantly in view of its extensive benefits. This paper presents a software that integrates building information modelling (BIM) and VE in construction projects to support project stakeholders. The software is developed to automate the process of data extraction and manipulation from BIM and processing the extracted data to evaluate competing alternatives. A vital stage in applying VE is the evaluation of alternatives through different assessment criteria by project team members, which places subjectivity in perspective. To reduce subjectivity in the developed software, analytical hierarchy process (AHP) algorithm is used to support VE multi criteria decision making. The developed integration software was implemented in prototype software that is named Value+. It is a three-tier software, which utilizes an object-oriented BIM model. It has been applied to an actual case study to demonstrate and verify its use and capabilities. The project is phase 2 of a new liquid natural gas (LNG) support campus with 1000 m² land area. Nine evaluation criteria were selected to choose the optimum solution from three alternatives for a slab structure system.

(CDR-3352) Pricing Deleted Work in Public and Private Contracts

Author(s)/Presenters(s): Bryan Payne, PE CCP CFCC Esq.

Level: Intermediate  
TCM Section(s): 10.3. Change Management, 6.2. Asset Change Management  
Venue: 2020 AACE International Conference & Expo

Abstract: When the owner deletes scope from a construction contract how should the deductive change order be priced? Assuming each party will generally argue that the basis for the pricing should be the pricing most beneficial to itself, is there an objective rule that provides the basis for the credit for the deleted work? For Federally-funded construction work in the United States, the answer is yes. However, this general rule does not extend to private works of improvement and other countries have different rules that apply to this issue.

This paper examines the question of how to price deleted work starting from the general rule for Federally-funded projects, the principles that lead to the general rule, and how that rule is applied. The paper expands the inquiry to private construction in the United States and then to international jurisdictions seeking a common applicable general rule.
**Procedure for Analysis of Time Extensions in Unit Price Contract Quantity Overruns**

*Author(s)/Presenters(s): Emad Mofarej Kouchaki, CCP PSP; Christopher W. Carson, CEP DRMP PSP FAACE*

**Level:** Intermediate  
**TCM Section(s):** 9.2. Progress and Performance Measurement  
10.1. Project Performance Assessment  
**Venue:** 2020 AACE International Conference & Expo

**Abstract:** Unit price contracts are often used to expedite procurement and shorten the overall duration of a project because a detailed design and final quantity takeoffs are not necessary to enable a contractor and owner to agree on a contract to perform the construction work. Even when the actual quantities are finalized, variations in quantities still occur for a variety of reasons, perhaps late value engineering, requests for information, or simply due to designer’s oversight. Although most contracts include a variation in estimated quantity (VEQ) clause, this clause does not necessarily explain contractor’s entitlement to additional time due to increased quantities. This paper provides guidance to an owner that will facilitate collaborative and effective analysis of delays and resolution of entitlement to extensions of time due to variations in quantities.

The proven approach is aligned with AACE Recommended Practice No. 29R-03 and ensures that the analysis will not create any future pitfalls should the issues require more formal dispute resolution. This process has been successfully implemented on multiple projects, an example of which is included in this paper.

**The Theory ofDelay**

*Author(s)/Presenters(s): Mark C. Sanders, PE CCP CFCC PSP*

**Venue:** 2020 AACE International Conference & Expo

**Abstract:** Many papers and texts published by AACE International and others have discussed the analysis of delay. Analysis involves the application of scientific or technical concepts. This paper presents the view that the underlying concepts for delay analysis have been insufficiently established or at least insufficiently documented. The industry has developed extensive principles of application without stepping back to develop the underlying theoretical framework. This paper directly addresses the question “What is Delay?” The scientific method of inquiry is applied to begin the development of an overarching theory of delay with the goal of establishing a firm logical foundation to support the sound application of analysis techniques.

**Why Are Dynamic Schedule Analysis Methods More Suited for Large, Complex Construction Projects?**

*Author(s)/Presenters(s): Dr. Nour El Imane Bouhou, PSP; John C. Wolf*
Abstract: Construction projects often experience schedule delays. Multiple delay methodologies can be used to analyze and quantify schedule delays. However, selecting the most adequate methodology remains a subject of controversy. The industry seems to hold that dynamic methods are better suited for complex projects with longer performance periods, while also holding that static methods can be used for simple projects with short performance periods for cost efficiency purposes. This paper discusses why dynamic methods are more adequate to assess project delays post construction for complex projects with longer performance periods and highlights major American court rulings related to dynamic schedule delay methods.

(CDR-3481) Early Completion Schedule Contingency Ownership Considerations

Author(s)/Presenters(s): Michelle L. McMillan, P. Eng.

Abstract: This paper was initiated by a situation encountered on a large institutional project. The owner stipulated a finish on or before contractual completion date. To gain a competitive cost advantage, during the bidding process, the contractor planned their work to be completed three (3) months early but there was no mechanism in the bidding process, such as the requirement for a bid schedule, to identify this condition. As work started the contractor’s schedules were compliant with the contract requirements and consistently showed a construction completion date, three (3) months earlier than the contractual finish no later than completion date. Late in the project, the consultant provided changes which required the contractor to be on site after their anticipated construction completion date but not after the final contractual completion date. The contractor put forward a request for additional compensation for the additional time on site, after their planned completion but before the contractual completion date.

This paper reviews the issues raised by this situation including ownership of project float, ownership of earned contingency and contract risk allocation. The paper also investigates the current recommended practices, legal and provides some alternative contracting solutions to deal with similar issues on future projects.

(CDR-3491) Case Study for Negotiating Time Extensions for Quantity Overruns in Unit Price Contracts

Author(s)/Presenters(s): Hamed Arabzadeh, PSP; Christopher W. Carson, CEP DRMP PSP FAACE
10.3. Change Management
Venue: 2020 AACE International Conference & Expo

Abstract: Construction projects are interwoven with unpredictability, primarily due to the number of assumptions that are made through project development. Every day, organizations enter into legally binding contracts to perform the construction work, which is defined by those assumptions. The unit price contract is commonly used to reduce project procurement duration since a final design with accurate quantity takeoffs is not necessary before the contract award. Even when detailed drawings are available at contract award, changes or omissions may take place, which can cause deviation from the approved design, significantly changing quantities to be installed, often beyond contractual thresholds. But extensions of time that should accompany increased quantities are often overlooked or poorly determined.

The focus of this paper is to provide solutions for the challenges that organizations face when such variances exceed the specified thresholds and start to impact the project’s schedule. This paper presents the case of a highway construction project as well as delay evaluation methodologies used by the general contractor and owner’s scheduling consultant. This paper provides recommendations for the contract awarding agency to enhance resolution in similar situations.

(CDR-3516) “Siri Told Me So” – Expert Witness Testimony at the Dawning of the Age of Artificial Intelligence

Author(s)/Presenters(s): Kenji P. Hoshino, CFCC PSP FAACE; Christopher J. Brasco, Esq.; Michael A. Pink; Matthew D. Baker, Esq.; Dr. William Ibbs

Venue: 2020 AACE International Conference & Expo

Abstract: This paper will explore technical and legal issues expected to be encountered in testimony of engineering, scheduling and cost expert opinions relying on the use of automated systems and artificial intelligence (AI). Specific topics include:
• The current state of the law and practice
• The degree of reliance on the output from automated systems and artificial intelligence.
• The extent to which the expert must be familiar with the inner workings of the software
• What data need to be provided in discovery
• Does proprietary software need to be provided for the opposing experts’ use?

The paper will conclude with a set of key considerations for experts, lawyers and policy makers regarding this fast-developing area of practice.

(CDR-3522) Compression Compensation for a Concurrently Delayed Schedule using Impacted As Planned and Modified Collapsed As Built Methods

Author(s)/Presenters(s): Abbas Saifi; Greg M. Hall, PSP

Level: Intermediate
TCM Section(s): 6.4. Forensic Performance Assessment
Venue: 2020 AACE International Conference & Expo
Abstract: For any construction project, unknown risks can become known problems that affect the project completion date. To reduce or altogether avoid delay to the project completion date, contractors often compress the schedule in the belief that such measures are mitigating actions. While such compression can restore the contractual project completion date without apparent added cost, it may increase project risk. This risk is amplified if the contractor does not clearly inform the owner of the mitigation steps taken and their potential cost. As such projects near completion, the contractor may realize that those risks have manifested as higher than anticipated cost, and the reward of earlier completion is far less than the risk taken. This paper demonstrates such an event and shows how two analysis methods defined in AACE International Recommended Practice 29R-03 can be modified to enable the contractor to analyze a zero slippage schedule which may contain concurrent delays. A contractor can use such an analysis to keep the owner informed of the full cost implications of compression measures and to request compensation for realized risks.

LIVE WEBINAR! (CDR-3539) The Law of Forensic Schedule Delay Analysis

Author(s)/Presenters(s): John C. Livengood, Esq. CCP CFCC PSP FAACE; Haley M. Derauf

Venue: 2020 AACE International Conference & Expo

Abstract: Forensic schedule analysis stands equally on three supporting pillars: (1) technical analysis, (2) professional expertise, and (3) legal precedent. AACE’s various recommended practices and articles on forensic schedule analysis provide a firm basis for technical analysis for experts to evaluate schedule delays and prepare opinions. Nevertheless, AACE’s RPs specifically disavow knowledge of the third pillar: legal precedent. Even so, all practitioners of forensic schedule analysis remain keenly aware of this third pillar and its influence on their work. Furthermore, these experts often refer to and rely on legal precedent in finalizing their work. This paper will consider the extent that experts should understand legal precedent as well as examine the law as it concerns the four major families of forensic schedule analysis methods identified in AACE Recommended Practice No. 29R-03 Forensic Schedule Analysis: As-Planned v. As-Built; Contemporary Period Analysis (Windows); Time Impact Analysis; and Collapsed As-Built.

(CDR-3541) Show Me the Money: Fundamentals of a Construction Claim

Author(s)/Presenters(s): Joseph V. Caldarera, PSP

Level: Intermediate
TCM Section(s): 6.4. Forensic Performance Assessment
10.3. Change Management
Venue: 2020 AACE International Conference & Expo

Abstract: One thing is evident on many large/complex construction projects – even the most well thought out plans require continual updating to maintain unexpected project issues. Oftentimes, the financial success of a project is determined by its management during unanticipated events. Claims, although not welcomed by any party, are especially not well-received by the party ultimately responsible for paying the claim. Nevertheless, getting paid for a legitimate claim may be the difference
between profitability and a loss. Owners, design professionals, or insurers that may become involved will better understand and accept claims if presented timely and clearly.

It is not uncommon to face owner opposition on a delayed construction project when attempts to quantify the delay are presented. Understandably, since on a project that is not delivered as anticipated, the owner might have expectations of assessing liquidated damages. However, if the owner team (or insurer) are provided a roadmap of the claim with support that minimizes the disputed elements of the claim there is a better chance for the claim to be fairly addressed. This paper will identify basic steps to present a claim and to get paid for a compensable event beyond the contractor’s control.

(CDR-3549) Forensic Planning Implementation in the MENA Region: Correlations to AACE Recommended Practice No. 29R-03

Author(s)/Presenters(s): Dr. Waleed Mostafa El Nemr; Hossam A. Eid Mohammed Kandeel, EVP; Haya S. Saleh, PSP

Level: Intermediate
TCM Section(s): 10.1. Project Performance Assessment
                      9.2. Progress and Performance Measurement
Venue: 2020 AACE International Conference & Expo

Abstract: Delay analysis techniques are a frequent topic of discussion in construction law literature. Delay analysis guidelines, such as The Society of Construction Law (SCL)’s Delay and Disruption Protocol, and forensic schedule analysis guidelines, such as AACE International’s Recommended Practice 29R-03 Forensic Schedule Analysis (“RP”), were developed in the United Kingdom and United States respectively to provide practitioners across the world with useful tools for implementation. A broad picture outside the United States and the United Kingdom, however, demonstrates that there is seldom any literature or guidelines produced as to how the Middle East and North Africa (MENA) region implements forensic planning methods outlined in the RP and the extent to which these methods are followed in this region. Through the analysis of a select number of projects in the region, which were selected by the authors as a representative sample from numerous other experiences in miscellaneous countries throughout the region, this paper sheds light on the forensic planning methods generally practiced in the region. Of course, the discussion in this paper cannot be generalized to all countries of the MENA region or even to the countries of the selected projects in this paper. The authors also acknowledge that deviations from the RP that are reported in this paper may not be necessarily tied to a geographical location, but rather, may reflect preferences by contractors generally, depending on the circumstances of the project. However, it is the authors’ intent that this paper serves as a step towards gaining insight on how forensic planning methods are applied internationally and the possible deviations from the RP.

(CDR-3551) Visualizing the Impact of Concurrent Schedule Delays Using Linear Scheduling Method

Author(s)/Presenters(s): Dr. Ricardo M. Tapia; Dr. Douglas D. Gransberg PE

Level: Advanced
Abstract: Quantifying the impact of concurrent delays due to differing site conditions, weather, and quality issues transcends merely revising schedule durations. Differing site conditions typically occur early in the project, directly or indirectly impacting subsequent activities. When concurrent delays for weather and contractor quality problems are added to the mix, forensic analysis becomes complex. The issue is further complicated by the fact that the courts have recognized four different methods for using critical path method for forensic delay analysis. The paper demonstrates linear scheduling method as a tool to visualize the as-built and the as-planned schedules in a single graphic. The tool combines contractor daily work report data with visualizations of the geotechnical baseline report, actual weather data, and quality control reports. The paper demonstrates the approach by applying it to a delay claim found on an earthen dam project that was part of the Panamá Canal Expansion project. The paper concludes that the proposed tool furnishes a common ground for explaining contractor and owner-caused delays, providing a common foundation from which to negotiate schedule impact.

LIVE WEBINAR! (CDR-3552) Suspend Work - "Remain on Standby" - 3 Key Words

Author(s)/Presenters(s): James G. Zack, Jr. CFCC FAACE Hon. Life

Level: Intermediate
TCM Section(s): 9.2. Progress and Performance Measurement
10.1. Project Performance Assessment
Venue: 2020 AACE International Conference & Expo

Abstract: The contract has been awarded and notice to proceed issued. Work has started. The owner issues a suspension of work directive and the contractor shuts down all or a designated portion of the work awaiting the owner’s return to work order. The contractor believes they are entitled to recover all delay and all time related delay damages. Is the contractor right? The owner is liable for the delay damages, right? As Max E. Greenberg commented in 1954 – “It ain’t necessarily so!” This paper examines why owners should have a Suspension of Work clause in contracts and how these clauses work. It identifies what damages are typically owed when an owner suspends all or part of the work and outlines some typical limitations of suspension damages found in many contracts. Additionally, the paper discusses five key court cases decided between 1996 and 2015 that establish the key requirements necessary to collect damages arising from a suspension of work directive. Finally, the paper offers recommendations on what actions contractors should take to protect their recovery of such damages and why these actions may help owners resolve suspension of work claims in the field rather than the court.

(CDR-3556) Comparison of Delay Analysis Methodologies in a Builder’s Risk Context

Author(s)/Presenters(s): Jonathan D. Perry, CCP EVP PSP; Que-Anh Pham

Level: Intermediate
TCM Section(s): 6.4. Forensic Performance Assessment
Abstract: Owners and contractors know to turn to their contract for the “rules of the road” when preparing or evaluating construction claims. The evaluation of a delay claim made under a builder’s risk insurance policy also involves the terms contained in the project’s builder’s risk policy and endorsements, which may differ greatly from the terms of the construction contract, and that are often unfamiliar to many project stakeholders. This paper will discuss the differences between conventional delay claim preparation and that which is customary for insurer acceptance following builder’s risk losses. The analysis will include a discussion of commonly used insurance policy terms, a comparison of delay analysis methodologies, and a discussion of how time-related costs are evaluated in a builder’s risk context.

LIVE WEBINAR! (CSC-3429) Top Ten Successful Approaches to On-Time Completion

Author(s)/Presenters(s): Glen R. Palmer, CFCC PSP FAACE; Christopher W. Carson, CEP DRMP PSP FAACE

Level: Basic
TCM Section(s): 7.2. Schedule Planning and Development
Venue: 2020 AACE International Conference & Expo

Abstract: Many projects today fail when it comes to completing on the planned final completion date. This failure is generally due to a number of issues related to the quality of the analysis of delays, owner commitments, and contractor performance problems. A deep-dive technical analysis, supported by lessons-learned and deep experience in problem resolution and mitigation of delays, greatly improves the opportunities for achieving on-time completion. Unfortunately, this deep dive technical analysis is often not performed, whether it is due to inexperience, lack of competence, limited time for analysis, or weak analysis. The use of a system to provide completion prediction and analysis streamlines the effort and ensures that these ten approaches are consistently followed for a successful completion.

In this paper, the authors continue their series of “Top Ten” issues and will give you their top ten approaches for enhancing a project’s chances of meeting this planned date. The authors of this paper are widely experienced in planning and scheduling complex projects, dispute resolution analyses, project controls, project management and have testified as experts in forensic and project schedule analysis.

(CSC-3441) Progress Earning Rules of Credit and Their Impact on Cash Flow

Author(s)/Presenters(s): Ferdinand R. Karbowski, Jr. PSP

Level: Intermediate
TCM Section(s): 9.2. Progress and Performance Measurement
9.1. Project Cost Accounting
Venue: 2020 AACE International Conference & Expo
Abstract: Many owners establish standardized earning rules of credit for progress measurement. Cash flow is most certainly an important consideration on any project whether from an owner’s perspective or a contractor’s perspective. The weighting associated with these rules of credit will undoubtedly have an impact on cash flow. This paper will discuss and illustrate the impact to cash flow for various rules of credit scenarios. The paper will focus on standard rules of credit for engineering, procurement, and construction. In the end, understanding how rules of credit for progress measurement affect cash flow can lead to a sustainable methodology that be used to mitigate the challenges of accurately measuring projects.

LIVE WEBINAR! (CSC-3546) Project Controls Reporting: Having the Message Heard

Author(s)/Presenters(s): Christopher P. Caddell, PE CCP DRMP; Charlene Sue de Beer; Nataliya Rutylo

Level: Basic
TCM Section(s): 11.3. Information Management
Venue: 2020 AACE International Conference & Expo

Abstract: Project controls reports during the lifecycle of a project are critical to helping the management team understand how the project is performing from a productivity, progress, schedule, and cost perspective. These reports provide not only information about performance to date but forecast the likely outcomes at the completion of work. However, all too often the critical messages in project controls reports are not heard or even worse ignored, negating the benefit they provide in helping the team manage the project to a more successful outcome. These reports often lack the necessary attributes to ensure the message is heard by the management team such that they act on it. Best practice project controls reporting depends on having the right content, issued in a timely manner, formatted well, with the issues identified and recommendations provided where possible. A well-structured, well delivered project controls report is more likely to resonate with the management team and have the impact it should on their decision making.

(DEV-3444) Key Partnership Indicators in Project Cost Management

Author(s)/Presenters(s): Lori D. Vidak; Satinder S. Baweja, CCP

Level: Basic
TCM Section(s): 11.2. People and Performance Management
Venue: 2020 AACE International Conference & Expo

Abstract: Cost engineers usually think of their work on projects in terms of data, analysis, reports, plans, and schedules. However, producing superior plans and schedules, collecting the most relevant data for the best analysis, and sharing valuable, useable reports requires effective communications within the working relationships of the project.

On each project, every cost engineer has many working relationships that affect the product produced. These are active partnerships. Also, less noticeable relationships exist between the cost engineer and the end-users who access their work for decision-making. The authors will present a map for tracking
these relationships, highlight those that most often hinder or harm project delivery, and present the top five ways to improve these relationships.

(EST-3341) (Presentation Only) Overview - The Estimate Basis

**Author(s)/Presenters(s): Michael French, PE; Dave Kyle, CCP CEP**

Venue: 2020 AACE International Conference & Expo

Abstract: This session outlines the need for a well defined estimate basis. When prepared correctly, any person with appropriate experience can use the BOE to understand and assess the estimate, independent of any other supporting documentation. A well-written BOE achieves those goals by clearly and concisely stating the purpose of the estimate being prepared (i.e. cost study, project options, funding, etc.), the project scope, pricing basis, allowances, assumptions, exclusions, cost risks and opportunities, and any deviations from standard practices. In addition, the BOE is a documented record of pertinent communications that have occurred and agreements that have been made between the estimator and other project stakeholders. The BOE is characterized as a deliverable that documents the scope and cost of the project, and ultimately becomes the basis for change management. This presentation is based on 106R-19 (Development of Cost Estimate Basis - as Applied in Engineering, Procurement, and Construction for the Process Industries); and 34R-05 (Basis of Estimate).

LIVE WEBINAR! (EST-3342) (Presentation Only) Overview - Planning the Development of the Estimate

**Author(s)/Presenters(s): Michael W. Smith, II; Dave Kyle, CCP CEP**

Venue: 2020 AACE International Conference & Expo

Abstract: This session outlines the requirements for a well defined estimate plan. The early development of this document is crucial for a successful estimating process. The proper preparation and presentation of this key document greatly increases the likelihood of obtaining the desired results by all stakeholders. The Estimate Plan should identify key stakeholders, expectations, standards, scope definition, schedule, individual responsibilities, and expected methodologies. The plan provides opportunity to clarify expectations of stakeholders, allows time for proper preparation of estimate inputs, and generally results in less rework and/or unacceptable deliverables. This presentation is based on 105R-19 (Owner's Estimate Requirements Document - as Applied in Engineering, Procurement, and Construction for the Process Industries); 36R-08 (Development of Cost Estimate Plans - as Applied in Engineering, Procurement, and Construction for the Process Industries); and 35R-09 (Development of Cost Estimate Plans - as Applied for the Building and General Construction Industries).

(EST-3345) (Presentation Only) Estimating Overview

**Author(s)/Presenters(s): Dave Kyle, CCP CEP**

Venue: 2020 AACE International Conference & Expo
Abstract: This presentation for estimators (or any other Project Controls professionals seeking a better understanding of estimating) is a follow-up to TCM-XXXX Project Controls Overview: Putting Together the Pieces of the Puzzle. This session is based on the AACE publication Skills and Knowledge of Cost Engineering (6th Edition) Chapter 9 and provides a brief introduction to each facet of estimating including; estimate classification, required inputs and maturity level of the inputs to the estimate, planning the estimate, structuring the estimate, various common methodologies used to develop conceptual and deterministic estimates, estimate accuracy, risk analysis and contingency, the importance of integration with Cost and Schedule, documenting the basis of the estimate, and proper estimate presentation, review and validation.

Each section of this presentation will be examined in detail in subsequent sessions throughout the remainder of the four days.

(EST-3354) Construction Indirects: Classifying, Allocating, & Managing

Author(s)/Presenters(s): Robin Williams; Kevin S. White

Level: Basic
TCM Section(s): 7.3. Cost Estimating and Budgeting
Venue: 2020 AACE International Conference & Expo

Abstract: When defining the basis of any project cost estimate, the project team must have reasonably thorough understanding of what goes into the construction effort from the contractor and owner sides of the equation. Often the numbers that build up the wage and indirect costs basis get indiscriminately tossed into a ‘loaded wage’ rate made up of assumed percentages and guesswork. This loaded wage rate first understanding glosses over important details that, if miscalculated, can negatively affect the success of the project budget. Furthermore, understanding those details will lead to better identification of gaps in scope, roles, and responsibilities from project stakeholders. This paper is written to combat gross misinterpretations of the construction total cost buildup. What elements make up a billable wage rate? What are some of the pitfalls to avoid when determining construction indirects for projects or programs? What are the factors that determine total indirect field costs? How does a deeper understanding of the construction indirects help contractors ask the right questions of clients? How does an owner determine which factors that have the most impact to their estimating methodologies? By considering these questions and more, the authors seek to increase awareness by and aptitude for the cost estimating practitioner and project professional.

(EST-3360) An Overview of Deterministic Estimating

Author(s)/Presenters(s): Kimberly Kozak

Level: Basic
TCM Section(s): 7.3. Cost Estimating and Budgeting
Venue: 2020 AACE International Conference & Expo

Abstract: The focus of this paper is to provide a detailed overview of deterministic estimating and will include: 1. methodology of a deterministic estimate; 2. the variations of detailed estimates (detailed, semi-detailed, and forced detailed); 3. Application of deterministic estimates based on the level of scope
development or estimate class; 4. Preparation of a deterministic cost estimate and prerequisite items; 5. Adjustment allowances to account for productivity, escalation, contingency, etc. and 6. Challenges faced with the development of a deterministic estimate.

**EST-3391) Risk Analysis Approach to Contingency From the Perspective of an Owner Estimator**

*Author(s)/Presenters(s): Christopher L. Kinney*

- Level: Advanced
- TCM Section(s): 7.6. Risk Management
  - 7.3. Cost Estimating and Budgeting
- Venue: 2020 AACE International Conference & Expo

*Abstract: When investing capital in projects, every plant owner has the right to know what they are buying, how much they are paying for what they are buying, is that a reasonable cost, and what are the risks. The optimal chance of success is for the project development team to “think like an owner”.

A simplified approach, process, and tool are identified in this paper for owners and their internal and/or external resources to use during the early stages of industrial plant project development to answer these questions.

This process supports a high-level snapshot confirmation of the owner and project team understanding, application, and resolution of the issues, risks, and opportunities necessary to accommodate today’s changing and aggressive business climate.

This approach:
- identifies and communicates owner expectations in the early stages of project development
- helps to confirm the owner and project team understanding of the risks the owner will or will not accept,[1]
- entices the project team to identify the level of potential for change in five major areas of project development during FEL
- captures and communicates the best professional judgement of the project team leaders at a single point in time occurring immediately prior to requesting full funding decisions,
- facilitates identification of previously unspoken, unresolved, or forgotten significant issues and opportunities,
- minimally confirms the level of completeness of the capital funding request,
- supports final contingency recommendation,
- is performed using a sustainable globally available tool, and
- identifies how owners define and use contingency verses the range of accuracy in project funding decisions

**EST-3403) (Presentation Only) Function Points: One Size Fits All**

*Author(s)/Presenters(s): Daniel B. French*

*Venue: 2020 AACE International Conference & Expo*
Abstract: There are many challenges when faced with creating estimates for software development projects. However, without a doubt, the single largest driver for cost, effort, and duration is project size. The typical approach to sizing a software project, if it is tried at all, is to 'estimate' • software lines of code (SLOC). While this may be the most expeditious method, history has shown that this approach usually produces highly inaccurate estimates. IBM developed function points as an alternative method to bring about more consistent and accurate project sizing for use in software project estimation. This methodology, while not a perfect solution, has enjoyed great success in more than 35 years of use worldwide. This presentation will provide a brief overview of the International Function Point Users Group (IFPUG) Function Point sizing methodology, its key concepts, as well as strengths, limitations, and misconceptions. Function point-based metrics, FP based contracting and other key uses for FPA will be covered. The presentation will also detail why FPA is preferable to SLOC or other sizing methods when creating software development project estimates.

(EST-3404) (Presentation Only) From Point A to Point Estimate: How Requirements Become Function Points

Author(s)/Presenters(s): Daniel B. French; Carol Dekkers

Venue: 2020 AACE International Conference & Expo

Abstract: The International Function Point User Group (IFPUG) function point analysis software sizing methodology has been successfully used by organizations for 30+ years. However, there remains confusion in the industry as to how the process works. Anyone who's heard of function points, but is not a practitioner, often does not understand how the functional requirements of a software project are 'translated' into function points. This presentation demystifies the Function Point Analysis (FPA) process and educates those interested in how function points are counted and/or are considering the use of IFUG Function Points in their organizations. The presenter will discuss functional vs. non-functional requirements, provide examples of good and poor requirements, and how an FP count is developed based on the functional requirements.

(EST-3412) (Presentation Only) Using Cost Engineering to Quantify and Identify Project Risks

Author(s)/Presenters(s): Anthony M. Bazzini

Venue: 2020 AACE International Conference & Expo

Abstract: Quantification of project cost risks prior to full funding is well established requirement and practiced by many companies as part of normal project development requirements. This presentation shares how ExxonMobil utilizes detailed cost estimates ("bid check") to model fixed price bids on large ventures (>>1 G$) to assess both bidder understanding of job requirements on direct and indirect accounts as well as associated imbedded financial risk assessments. An overview of work processes and practitioner skill requirements to accomplish this outcome will be shared. This presentation will be supported by case studies that demonstrate the value and insight which this process produces on world-class size ventures.
LIVE WEBINAR! (EST-3419) Estimating As It Pertains to Risk Management

Author(s)/Presenters(s): Shoshanna Fraizinger, CCP

Level: Intermediate
TCM Section(s): 7.3. Cost Estimating and Budgeting
7.6. Risk Management
Venue: 2020 AACE International Conference & Expo

Abstract: The outputs of estimating are typically a primary input for business planning, cost and risk analysis, management decisions, and project cost and schedule control processes. All these aspects of corporate strategy and project planning are bounded, or guided by, an organization’s risk appetite.

Estimating is fundamental to the ‘Assess’ & ‘Treat’ steps of risk management, as defined in AACE’s Total Cost Management Framework (TCM) and Skills and Knowledge of Cost Engineering 6th Edition (S&K6). Estimator skill is required to determine the cost impact of the risk (assess), and the cost to implement the plan to address the risk (treat), respectively. The cost impact of the risk contributes to the amount of contingency required. However, there are several facets of strategic planning wherein the cost estimating process can introduce, assess, or mitigate risk.

This document addresses the topic of estimating as it pertains to risk and the various facets of project risk, which can be affected by the cost estimate and the methods by which the estimates are developed. This paper is aimed at the junior to intermediate cost engineering professional and provides a single source for AACE references on this subject.

LIVE WEBINAR! (EST-3423) Overview of Conceptual Estimating Methodologies

Author(s)/Presenters(s): Larry R. Dysert, CCP CEP DRMP FAACE Hon. Life

Venue: 2020 AACE International Conference & Expo

Abstract: A common issue often faced by estimators is how to prepare an estimate when there is very little information or scope on which to base the estimate? This paper will discuss a variety of conceptual estimating methodologies, as well as some of the problems faced when using these techniques. There are many order-of-magnitude or conceptual estimating methods, and each is useful in specific situations. Often a single estimate will rely on using a combination of estimating techniques for different portions of the project. The conceptual estimating methods that will be briefly discussed in this paper include:
- capacity factoring
- parametric modeling
- end-product units method
- analogy, and
- expert judgment.

(EST-3424) Supporting Estimates with Effective Scope of Work Definition
Abstract: Most estimators realize that one of the essential ingredients for preparation of an accurate cost estimate is the comprehensive and sufficient definition, and subsequent control of project scope. Numerous studies have identified project scope definition as one of the most critical factors that influence project success. In 1982, the Construction Industry Institute (CII) Business Roundtable issued a report stating that "poor scope definition at the (budget) estimate stage and loss of control of project scope rank as the most frequent contributing factors to cost overruns." [1] Nevertheless, obtaining adequate scope definition to support cost estimating continues to be one of the most persistent problems faced by estimators.

This paper discusses issues involved in dealing with scope development problems during the preparation of capital facility cost estimates. Topics to be covered include:

- Introducing a stage-gate project development process
- Identifying the minimum requirements to prepare various classes of estimates
- Communicating information requirements to project teams and estimate providers
- Corelating estimating techniques to the level of scope information
- Utilizing a frozen for estimating design basis and incorporating late changes
- Presenting the estimate in relation to the level of scope definition

This paper expands upon an earlier AACE International paper Scope Development Problems in Estimating [2], incorporating information from AACE International (AACE) recommended practices on estimate classification, as well as from other sources.

(EST-3454) Base Estimate, Estimate Accuracy, and Contingency

Abstract: This paper explores the definitions and relationships of three total installed cost (TIC) estimate elements: base estimate, estimate accuracy, and contingency. These elements have various meanings and applications in process industries and the author seeks to present a clear perspective for their consistent use and quantification. Base estimate represents the most likely cost outcome of a project, within a range of probable outcomes, and is the basis for quantifying other estimate parameters. The base estimate value includes direct costs, indirect costs and design allowance, but does not include contingency or management reserve. Estimate accuracy is best measured from the base estimate value, rather than the TIC estimate value (base estimate plus contingency). Although the latter method is commonly used, it may undermine the purpose and definition of a base estimate by shifting the accuracy range high enough to exclude the base estimate itself (if contingency is much greater than the interval between the lower accuracy boundary and the base estimate). Contingency is used for a variety
of purposes, sometimes insufficiently and sometimes excessively. The author presents contingency as an addition to the base estimate for the purpose of establishing the TiC estimate value at a desirable confidence level for project funding.

**(EST-3480) (Presentation Only) Cost Estimate Classification Overview**

*Author(s)/Presenters(s): John K. Hollmann, PE CCP CEP DRMP FAACE Hon. Life*

*Venue: 2020 AACE International Conference & Expo*

Abstract: This presentation will review the basic concepts and principles of cost estimate classification systems as addressed in the AACE International (AACE) series of Recommended Practices (RPs) on the topic. The presentation will focus on Professional Guidance Document No. 1 (PGD-01) that was released by AACE in 2018. PGD-01, a hyperlinked online document, provides a roadmap for finding RPs relating to classification and estimate accuracy while also discussing the concepts and principles of classification. The presentation will also share the history of the concept as it evolved from the first AACE guideline on estimate types in 1958. Today, there is a series of industry-specific classification RPs aligned with common project phase-gate systems; these will be reviewed.

**(EST-3490) Cost Savings Possible from Converting California Offshore Platform Jackets to Artificial Reefs**

*Author(s)/Presenters(s): John B. Smith; Dr. Robert C. Byrd PE*

*Level: Intermediate*

*TCM Section(s): 7.5. Value Analysis and Engineering*

*Venue: 2020 AACE International Conference & Expo*

Abstract: This paper reviews cost estimates for decommissioning and fully removing the 23 oil and gas platforms located on the federal Outer Continental Shelf offshore California and estimates the costs that could be avoided (saved) if the platform jackets are partially removed and reefed in-situ rather than fully removed. The cost savings are calculated by estimating the weight of the jacket structure that would remain in-situ and multiplying that weight by a demolition cost ranging from $3,000 to $7,000/ton (short tons) for structure removal. This cost range was derived from a review of published information on estimated and actual jacket removal costs. The calculations show that if all 23 platform jackets are reefed in-situ the estimated total cost savings achieved would range from $856 million to $2.0 billion. Reefing is the process of removing all oil and gas related equipment and material that might contaminate the ocean from an offshore facility and leaving the remaining steel structure as habitat for marine life. On a per platform basis, the cost savings range from a low of $0.3 million for Platform Gina (84 tons remaining in-situ) to a high of $494 million for Platform Harmony (70,540 tons remaining in-situ). Under the California Marine Resources Legacy Act (AB 2503) the owners of oil and gas platforms who obtain approval to reef a platform jacket are required to share 65% to 80% of the cost savings with the State of California. Based on the cost savings estimates presented in this paper, the State of California would receive an allotment ranging from a low of $685 million to as much as $1.6 billion if all 23 OCS platforms were approved to be reefed in-situ.
A Discussion of the Cost Estimate Classification System: As applied in the Engineering, Procurement, Construction and Operations for the Environmental Remediation Industries

Author(s)/Presenters(s): Dan Melamed, CCP EVP; Bryan A. Skokan, PE CCP; Gregory Mah-Hing, PE; Rodney Lehman; Jake Lefman

Level: Basic
TCM Section(s): 7.3. Cost Estimating and Budgeting
Venue: 2020 AACE International Conference & Expo

Abstract: This article will discuss environmental restoration cost classification for projects within a regulatory framework that involves development of formal documentation, public input from external stakeholders, and ultimate approval by a regulatory authority. This regulatory framework has a specific focus towards environmental compliance under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). These United States (U.S.) federal laws are perhaps the best understood as a generic framework for environmental remediation that can serve as a proxy for other regulations (at international, national state and local levels) through the organization of the necessary steps of an environmental cleanup though six consecutive phases, indicating increasing maturity, described in detail in this article. Also, the reasoning and support for the classification of environmental restoration project cost estimates in relation to their maturity will also be discussed. In addition, the role of risk in environmental remediation projects is discussed.

Overview - Presenting an Estimate to the Client

Author(s)/Presenters(s): David Colangelo, CCP

Level: Basic
TCM Section(s): 7.3. Cost Estimating and Budgeting
Venue: 2020 AACE International Conference & Expo

Abstract: Presenting capital cost estimates can be challenging, especially when it involves the presence of clients, colleagues or perhaps a third-party review team. The pressure of preparing and presenting is coupled with the efforts of simply trying to finish an estimate on time. Requirements can vary according to the nature of each project, class of estimate, level of detail, type of client, time limits, and a host of other factors, and therefore a simple one-size fits all approach, or presenting the full estimate plan or basis of estimate is not ideal. Presentations are a powerful tool in helping to convey a message to clients, and it is sometimes the first window the client has into the overall estimate, so it’s important to deliver the best product, as future opportunities may be limited.

This article will attempt to discuss the important items to consider when presenting an estimate to a client. The intention is to create a starting point for estimators and project controls staff to use in the development of presentations from high level studies to detailed estimates and provide a basis upon which others can further develop and tailor their own set of standards.
Estimate presentations should also consider various technical and soft skills which can also help in the presentation process. Ideally, it would be recommended to consider developing custom presentation templates for various levels of estimates and applications, gradually improving and incorporating feedback into each subsequent version.

(EST-3563) (Presentation Only) Required Skills, Knowledge, Roles, and Responsibilities of a Project Estimator

Author(s)/Presenters(s): Peter R. Bredehoeft, Jr. CEP FAACE; Jeffery J. Borowicz, CCP CEP PSP FAACE

Venue: 2020 AACE International Conference & Expo

Abstract: This presentation will align the core estimating skills, knowledge, roles and responsibility for Project from various AACE International recommended practices. This presentation will outline the core competencies of a project estimator. The following is the list of project estimator discussion topics:
• Planning the Estimate
• Estimate Methodologies
• Quantification
• Costing
• Pricing
• Estimate Conditioning
• Risk Evaluation and Contingency Determination
• Estimate Documentation
• Estimate Reconciliation
• Estimate Review and Validation
• Estimate Reporting
• Estimate Closeout

This presentation will discuss the roles and responsibilities in relation to career development of a project estimator. This will outline the roles and from entry level to estimating manager.

This presentation will pull from key areas of the following AACE RPs:
• 11R-88: Required Skills and Knowledge of Cost Engineering
• 46R-11: Required Skills and Knowledge of Project Cost Estimating
• 101R-19: Roles and Responsibility of a Cost Estimator

LIVE WEBINAR! (EVM-3456) "You Can't Get There From Here" - Real World Application of RP 80R-13: Estimate at Completion (EAC)

Author(s)/Presenters(s): James E. Krebs, PE CCP FAACE; Brennan P. Cagney, CCP

Level: Basic
TCM Section(s): 9.2. Progress and Performance Measurement
10.1. Project Performance Assessment
Venue: 2020 AACE International Conference & Expo
Abstract: It is all too common for teams on projects experiencing poor earned value performance, early in the project, to report a forecast on target due to improvements expected from mitigation efforts. The inability to recover may happen sooner than personal experience may indicate, due to the compounding effect of poor performance. Utilizing Recommended Practice 80R-13, Estimate at Completion (EAC), and actual project data, this paper explores that timing and the ability to determine when the project goals are no longer achievable. Recommended Practice 80R-13 shows several accepted formulae to determine EAC. Using actual project data to calculate the cost performance index (CPI) and to complete performance index (TCPI) at various points in time will yield a comparison of varied project outcomes. Understanding CPI and TCPI early in the project can help determine if a project can, “get there from here.”

(EVM-3508) Analysis of the Earned Schedule Forecasting Accuracy

Author(s)/Presenters(s): Keight Charles Navarro Hurtado, PSP

Level: Advanced
TCM Section(s): 10.1. Project Performance Assessment
10.2. Forecasting
Venue: 2020 AACE International Conference & Expo

Abstract: The independent estimate at completion (IEAC) is a time-based earned schedule (ES) method that allows the analyst to estimate the duration of a project according to the information available for a period of time. The fact that there are two approved equations that may give different results hinders the acceptance of this important analysis.

The purpose of this paper is to describe the two equations and determine which is more accurate to estimate the final duration of a project. In this analysis, the average absolute percentage error, completed percentage, seriality of the network diagram and productivity index (PI) have been used to evaluate the accuracy of the two equations.

A study of eight real projects with early and late completion will be used to determine the accuracy of each method. The conclusion is that when the schedule performance index based on the time is less than 1 or the project has a delay, the equation of the IEAC with the PF=1 begins to lose accuracy and the equation of the IEAC with the SPI begins to gain accuracy or has fewer errors.

(EVM-3544) Earned Schedule as a tool to Forecast Indirect Costs

Author(s)/Presenters(s): Mostafa AbdelRazik, EVP PSP

Level: Intermediate
TCM Section(s): 10.2. Forecasting
Venue: 2020 AACE International Conference & Expo

Abstract: Earned value management (EVM) is utilized world-wide to measure work progress, compare it against a baseline and evaluate cost and schedule variances. Furthermore, EVM is used to “predict the future” by assuming a future performance, to generate an estimate at completion (EAC) for a project.
Applying EVM to calculate EAC has been discussed in many literatures. These literatures detailed the process, requirements and steps needed to have an adequate EV. However, there was not enough mention of indirect costs and how they can be evaluated. Estimating cost at completion for indirect costs can be cumbersome, especially that indirect costs are directly linked to time and not cost performance. Since EVM’s schedule performance indicators are not a true reflection of a project’s schedule performance, especially at late stages of the project where there is a slight to no change to the planned value. Earned schedule (ES) technique was deemed to provide a better indication of a project’s schedule performance. Moreover, ES can provide a more accurate estimate of the expected finish date of a project.

This paper will discuss the use of ES technique as a tool to predict the estimate at completion of indirect costs.

(INT-3343) Claim Reducing Orientated Model in China

Author(s)/Presenters(s): Lan Zhang; Hao Hu; Shenjing Zhang

Level: Basic
TCM Section(s): 7.7. Procurement Planning
10.3. Change Management
Venue: 2020 AACE International Conference & Expo

Abstract: In the project construction business, claims submitted by the contractor often delay the construction schedule and increase the project cost. The traditional Chinese construction contract template had been created on the basis of the completion of engineering work of the relevant project as the start point of the project. Yet, nowadays the fast-track model is general adopted in the trade of project construction, and as the consequence those types of contract templates cannot cover all activities or clearly identify responsibilities and consequences in general, and particularly when the project is difficult. In addition, the situations are made more complicated to the project management / construction parties especially when the client’s on-site project management team steps in the matters in “grey areas” of such contract mentioned above. Significant claims are filed to cover the schedule and cost impacts. Both sides spend much time and energy to test their wills and demonstrate their power in the relationship, but are then forced to settle. From the project point of view, few studies have been conducted concerning how to fundamentally reduce claims. This study examines procurement strategies and regulatory requirements to identify the best stakeholders to participate in a project. Rather than try to shift risks to the other party, further redefining the roles and responsibilities of each party is better. Considering these two points and revisiting the general contract conditions currently used in China, the revision of some special conditions is strongly recommended. The claim reducing orientated model is presented and tested using an international theme park project in China. The results demonstrate that potential claims can be significantly reduced.

(INT-3381) Dealing with Requests for EOT: The Peru Public Contracts Case

Author(s)/Presenters(s): Guido J. Reyes

Level: Basic
TCM Section(s): 9.2. Progress and Performance Measurement
10.1. Project Performance Assessment

Venue: 2020 AACE International Conference & Expo

Abstract: During the last two decades, the Peruvian government has been undertaking a growing multitude of public works projects of differing complexity, risks, and costs to develop the country’s transportation and public services infrastructure. These diverse projects have been executed under various circumstances and conditions; therefore, the need to properly manage and resolve the potential impacts and disputes that typically arise during project execution has also become increasingly important.

One common dispute that arises during the execution of construction projects is contractor extension of time (EOT) requests due to the prolongation of the completion date. This paper provides a review of the current contractual language and requirements to obtain an EOT (and related compensation) included in a sample of Peru public work contracts and the Peruvian State Contracting Law. Current Peruvian State Contracting Law and contracts establish defined guidelines for determining costs associated with EOTs and set clear timelines for the submission and approval of EOT requests; however, the law and contract provisions are undefined when providing guidance for other important issues, such as the identification of potential causes, responsibility and duration of delay, and entitlement for compensation related to EOTs. To address these uncertainties, generally accepted, industry recognized practices, documents and treatises may be used to provide clarity and complement Peruvian public contracts and State Contracting Law with regard to the management and resolution of EOTs.

(INT-3435) Successful Holistic Approach for Cost Optimization in a Mega Project

Author(s)/Presenters(s): Sahaiza Saat; Jesmin Jamel

Level: Basic
TCM Section(s): 7.5. Value Analysis and Engineering
7.1. Project Scope and Execution Strategy Development
Venue: 2020 AACE International Conference & Expo

Abstract: The Pengerang Integrated Complex (PIC) is the largest greenfield downstream investment by PETRONAS in Malaysia at USD27 billion. Situated within Johor’s Pengerang Integrated Petroleum Complex (PIPC), PIC consists of a Refinery and Petrochemical Integrated Development (RAPID) and supporting facilities, including centralized utilities, a raw water supply and treatment plant, an air separation unit, a cogeneration plant, a deep water terminal and a regasification terminal.

Aligned with PETRONAS group-wide transformation and cost reduction efforts in response to the massive oil price drop in 2014, PIC embarked on strategic CAPEX reduction initiatives to optimize cost and sustain the project delivery.

This is accomplished through rigorous value improvement practices, including optimization of its extensive project management organization, implementation of value engineering during engineering, procurement, construction and commissioning (EPC) phase, deferment of non-essential facilities and refinement of materials & services contracts management.
The successful implementation of the initiatives resulted in overall CAPEX reduction, and also provided effective project stewardship and control, resource optimization, productivity increment, enhanced coordination and alignment within the project team as well as improving preparedness for facility operation.

**Use of Drones and Emerging Technology in Megaproject Supply Chain**

*Author(s)/Presenters(s):* Dr. F. Fred Rahbar; Musaab Al-Rushood; Dr. Fikri T. Dweiri

*Level: Advanced*

*TCM Section(s):* 11.3. Information Management
  7.4. Resource Planning

*Venue: 2020 AACE International Conference & Expo*

*Abstract:* Project stakeholders go through painstaking exercise to identify required material and to expedite them for timely delivery to the site in avoiding project delays, thus creating complicated warehousing and logistics challenges of having the right material at the right time and location. This paper presents an analytical model to manage the megaproject warehousing issues. Drones equipped with streaming video capability can help survey a site, identify optimal locations for warehouses, and monitor the jobsite for suspicious activity — allowing the project team to easily monitor locations and quantities of assets and materials at a glance to ensure they will be there when needed. When the request for a particular material arrives, an optimal path is digitally mapped for the drone to travel based on mapping done previously.

The paper will discuss an optimization model for warehouse management through the use of drones and artificial intelligence (AI). An analytical model of warehousing management with huge potential cost and schedule savings will be presented.

**A Model for Project Governance for Major Construction Projects – Owner’s Perspective**

*Author(s)/Presenters(s):* Tariq Hussain

*Level: Advanced*

*TCM Section(s):* 7.1. Project Scope and Execution Strategy Development
  4.1. Project Implementation

*Venue: 2020 AACE International Conference & Expo*

*Abstract:* “Effective project governance, within corporate governance framework, has become a serious concern for organizations” (Crawford, Cooke-Davies, 2005). A research was conducted to evaluate the current understanding of project governance in the construction industry, recognize the current governance practices, and evaluate the existing project governance structures. Findings of the research revealed various levels of understanding of project governance and a range of governance structures in practice within industry. In this paper a new project governance model is proposed. The model recommends project owner organizations to reorganize their project governance structures, improve their policies and procedures, develop tools that support project governance, make it mandatory for project personnel to follow governance procedures, improve the governance role of project
management office (PMO), do audits for compliance, keep processes updated, and use lessons learned. The results of the focus group survey, conducted to validate the new governance model, revealed an overall agreement from industry professionals. The researcher concludes that the new governance model applied proficiently will help project owners improve governance, oversight and project predictability for major construction projects.

(OWN-3478) Owner Validation of Contractors’ Cost Forecasts

Author(s)/Presenters(s): Robert C. Mathias; Paul G. Williams; Christopher F. Michalak

Level: Intermediate
TCM Section(s): 9.2. Progress and Performance Measurement
Venue: 2020 AACE International Conference & Expo

Abstract: Owners, construction managers, and prime contractors to whom another contractor is providing craft labor on a reimbursable (RE) or time-and-materials (T&M) basis are faced with accepting risk associated with the performance of the contracted workforce. RE/T&M contractors would periodically be expected to issue reports indicating manhour and labor costs to-date, as well as, forecasts through, and at completion.

Whether being charged with actively managing the contractor or simply paying the bills, it is important to understand whether such reports from the contractor represent viable forecasts going forward. Developing an opinion of whether or not the data makes sense, and if the reports may be possibly overstating or understating forecasts are critical to success.

Early identification of issues maximizes the time available to initiate corrective decision-making, and hence enhances the probabilities of successful outcomes.

This paper is intended to familiarize readers with basic concepts that can be applied to the review of such contractor labor forecasts, enabling them to pro-actively deal with issues identified.

(OWN-3494) (Presentation Only) Owner Project Management Challenges that Affect Cost and Schedule Outcomes

Author(s)/Presenters(s): Stephen L. Cabano

Venue: 2020 AACE International Conference & Expo

Abstract: It's no secret that project outcomes of large to mega scale projects in the process industry are less than stellar. Numerous papers/presentations have outlined the effects these project 'blowouts' have on owner business results. This paper will provide hands-on feedback from owner organizations across the process industry on these Business and Project Management challenges. These issues address aspects of project work such as Owner's inability to lock down capacity, variability and feedstock requirements early in the asset development process typically resulting in late project changes. The paper will also address poor scope definition and scope freeze at project sanction which causes cost/schedule fluctuations between sanction and project end results. Other owner issues include poor
contracting strategy selection, ineffectual change management, inadequate project controls, misaligned operations and maintenance expectations, etc. Contractor productivity and performance issues will also be discussed. Results of a recent owner study conducted by Pathfinder will be shared that address these issues. Metrics will be provided by the Construction Industry Institute regarding effective application of industry best practices. The session will correlate these issues back to Cost Engineering and Project Control practices and provide proven solutions to address pitfalls and support owner business opportunities with effective/efficient project delivery.

LIVE WEBINAR! (OWN-3495) Deploying An Assurance Framework to Identify and Repair Distressed Projects

Author(s)/Presenters(s): Joshua P. Rowan, CCP

Level: Advanced
TCM Section(s): 11.1. The Enterprise in Society
           11.2. People and Performance Management
Venue: 2020 AACE International Conference & Expo

Abstract: Large capital projects are by their nature complex. Throughout their lifecycle, events and risks will occur that, individually or collectively, have the potential to derail them. In response to this, many capital-intensive owner organizations have developed project stage-gate systems as a part of corporate governance. These systems are very useful for project shaping as well as front end engineering and design (FEED) but less helpful in the execution stage when the majority of capital funds will be expended. Traditional audits focus on adherence to approved processes and procedures which is necessary but not sufficient to guarantee a successful project outcome. The field of project assurance developed in response to these shortcomings and is now mandated by many governments, insurers, and financing entities. Project assurance, as practiced today, is additive to a stage-gate process and critical for projects after the organization’s final investment decision. Although each assurance review is unique, a common framework is possible if one considers the typical capital project failure elements. With this framework, an organization is able to more readily identify and repair distressed projects.

(OWN-3497) Managing Scope Creep in the Public Sector

Author(s)/Presenters(s): Rashmi Vailaya; Moraima Dones

Level: Basic
TCM Section(s): 7.1. Project Scope and Execution Strategy Development
           10.3. Change Management
Venue: 2020 AACE International Conference & Expo

Abstract: Scope creep, also called kitchen sink syndrome in project management, refers to uncontrollable continuous scope changes at any point after the project start. When a project requires changes due to scope creep, new tasks most likely will require additional budget and may cause delays in the schedule. Even though the schedule and budget are different concepts, they are in fact an integrated component and if one does not capture the total project scope correctly or plan for scope changes, there is little hope that the project can be executed favorably for the budget or schedule. This
paper presents a case study of a rail transit project and discusses the causes and strategies to tackle scope creep.

**(PM-3253) (Presentation Only) How to Create World Class Project Management Organization?**

*Author(s)/Presenters(s): Dr. Nick J. Lavingia, PE*

*Venue: 2020 AACE International Conference & Expo*

*Abstract: This practical presentation is based on how a company created world class project management organization that delivered pacesetter project performance. Industry benchmarking showed that these projects were safer, better, faster and cost less compared to the competition. The formula for success included:*

1. Understanding project management’s impact on the bottom line of the company by improving return on capital employed and ultimately total shareholder return.
2. Implementing structured project development and execution process which enabled effective communication between decision makers, multifunctional project team and stakeholders.
3. Demanding use of project management best practices to optimize safety, cost, schedule and operability of projects.
4. Insisting on the use of total cost management tools for estimating, planning/scheduling, project controls, etc. to deliver projects on time and within budget.
5. Providing project management training and certification for executives, management and project professionals.*

**(PM-3407) Challenges for Cost Control in Operations in Peruvian Small Companies of Construction**

*Author(s)/Presenters(s): Gloria Luz Flores Fernandez*

*Level: Basic*

*TCM Section(s): 11.2. People and Performance Management*

*Venue: 2020 AACE International Conference & Expo*

*Abstract: In the last decade Peru has experienced a growth in its economy, which is positively impacting all sectors, especially construction. This conjuncture brings advantages and opportunities for all, especially for small construction companies which face new challenges seeing themselves in need of implementing new management tools that will allow them to obtain competitive advantages in the market.*

*One of the main challenges is the change of its organizational culture, which tends to be of the type of young, small, and inexperienced organizations. This paper will identify the primary weaknesses of small companies by examining their internal operating processes, where the staff covers multiple functions and tasks. It also describes the internal processes of companies that have implemented and are using management tools to control construction projects.*
To carry out the implementation of cost control tools in a typical Peruvian small construction company successfully, 5 stages are identified where the processes and actions to be executed by all the company’s collaborators will be described.

It is concluded that it is feasible to implement cost control tools for a small business, provided there is a commitment from the management, since active participation and effective leadership is key for the success of the proposed process.

(PM-3470) Human Factors in Project Planning and Management: Suggestions for Improvement

Author(s)/Presenters(s): Michael O. Onotano, EVP

Level: Basic
TCM Section(s): 7.2. Schedule Planning and Development
9.2. Progress and Performance Measurement
Venue: 2020 AACE International Conference & Expo

Abstract: The science and practice of project management has made significant progress within the past few decades. Advanced tools, improved processes, and research have contributed immensely to the practice. However, in every Industry, from high-tech to low-tech, from everyday construction to innovative research, the world abounds with projects missing deadlines, overrunning budgets, failing to satisfy requirements, and some being canceled prior to completion. These failures unfortunately are not the exception but the norm. Project outcomes and successful delivery have not been impressive despite evolving practices, training of project management professionals, and availability of powerful project management tools.

Project management knowledge and tools are only as effective as their proper application by the people who use them. This paper is focused on the human aspect of project management especially at inception and during planning. It explores several biases, misconceptions and misrepresentations with historical examples to illustrate how these influence project decisions. It provides practical suggestions based on research and real-life applications that can help improve project delivery outcomes. It highlights awareness of the human aspects and recommends evaluating its impact when making project decisions because project success is mostly based on the decisions, made or failed to make.

LIVE WEBINAR! (PM-3586) (Presentation Only) Palms Up – A Servant Leadership approach for Project Management and Support

Author(s)/Presenters(s): Richard C. Plumery, EVP

Venue: 2020 AACE International Conference & Expo

Abstract: This presentation will address how to apply a serve, support and protect approach at every level of the organization including leading and supporting projects and programs. This will tell the stories of the presenter’s life journey.
These experiences included:

- Conducting a local press conference for a new voice-controlled computer, which a fledgling CNN picked up a broadcast worldwide in the early 90’s.
- Starting a tactical supply company with two of the original SEAL Team Six members a month before 9/11.
- Starting a nationally recognized sports performance coaching center which coached some of the best athletes of our time.

Learn how these experiences ingrained a servant leadership approach to project management and support. These learned techniques were the force behind a multimillion-dollar turn-around of a business with 5000+ projects and 1000+ project managers in just a few short months and changed the way we do business today.

Key techniques will be shared on:

- How to value Attitude v Aptitude
- How to build engagement and motivate project support teams
- How to build the “trust bridge” between groups and levels
- How to balance empowerment with risk management
- How to “fool-proof” performance metrics and information
- How to make decisions that don’t sink the project’s chance for success
- How to quickly get to root causes and realign problem projects with a sustainable recovery plan
- How to deliver synergistic results

(PS-3333) (Presentation Only): Two Truths and a Lie Game: Fellows Edition

Author(s)/Presenters(s): Christopher W. Carson, CEP DRMP PSP FAACE; Ronald M. Winter, PSP FAACE; Valerie G. Venters, CCP FAACE; Glen R. Palmer, CFCC PSP; Kenji P. Hoshino, CFCC PSP

Venue: 2020 AACE International Conference & Expo

Abstract: The AACE Fellows have hundreds of years worth of experience in all the cost engineering/project controls disciplines, and this session is an opportunity for Fellows to give back to the community. This year the war stories will all follow a theme of Recovery and Mitigation Efforts that Went South. The session will include a Moderator, three Storytellers, and a Doubter, all AACE Fellows. The three Storytellers will each provide three short war stories from their past projects, each of which will include two truths and one lie in their mix of stories, and the Doubter will question each Storyteller and provide challenges and objections in an effort to prove the stories to be lies. Then the audience will get a chance to ask follow up questions and subsequently vote on whether the story is a Truth or a Lie.

(PS-3371) A Proposal for a Standardized Set of Definitions of Work Availability

Author(s)/Presenters(s): Michael A. Mac Guinness, C.Eng.

Level: Intermediate
TCM Section(s): 10.1. Project Performance Assessment
10.2. Forecasting
Venue: 2020 AACE International Conference & Expo

Abstract: Work availability is a frequent topic of discussion when it becomes necessary to resolve challenges resulting from unforeseen events. Nevertheless, there is no agreed definition of it, and without definition, there is no way to consistently quantify it. In practice, concepts of work availability are remarkably fluid. They vary according to the time scale considered, the effect of work sequence, and the assessment of multiple other factors.

In its most expansive definition, work availability can be considered “all work for which IFC drawings have been issued minus completed work.” At the other extreme, this definition could be limited to “work for which all necessary prerequisites including but not limited to labor, material, permits, etc., are complete and ready at site for installation.” It is not unusual for Owners and Contractors to have heated disagreements regarding work availability due to unrecognized differences in their concept of it.

A set of definitions is proposed that reflects the stages of preparation of work as its prerequisites are completed before its scheduled dates, and as it progresses through the medium and short term planning process.

A simple system dynamics model is used to dynamically quantify and to illustrate graphically the quantity of work in each stage, how that changes over time, and how expectations for work availability influence manpower planning and mobilization.

(PS-3372) Schedule Effectiveness versus Specification Compliance, Which Should Prevail?

Author(s)/Presenters(s): Robert M. Freas; Adam S. Lackey; Gayathri Shetty

Level: Basic
TCM Section(s): 7.2. Schedule Planning and Development
10.1. Project Performance Assessment
Venue: 2020 AACE International Conference & Expo

Abstract: When projects are affected by unexpected or as-built events such as unforeseen conditions, design errors and/or omissions, or owner/tenant requested changes, the contractor’s baseline schedule and execution plan are not typically realized. Industry recognized authorities recommend that project schedules be regularly updated with two purposes in mind: reflect the current status of the project and keep the schedule as an effective management tool. These objectives can be at odds with project specifications that prohibit revisions to the schedule unless approved by the owner. If the schedule is not kept current, does the schedule become obsolete and nothing more than a payment application tool? This paper will present an in-depth discussion of why the contractor should be permitted to keep the schedule current and the problems that result from this prohibition, as well as the owner’s perspective of not allowing the contractor to revise the schedule to include as-built events occurring during project execution. Possible risks that the parties can be exposed to in these situations will also be identified and discussed. Finally, this paper will present proposed solutions for the parties to consider, which attempt to satisfy the specification requirements and keep the schedule as an effective management tool.
(PS-3400) Managing Contractor Schedule Submittals with Higher Efficiency

Author(s)/Presenters(s): Thomas Polen
Level: Basic
TCM Section(s): 4.1. Project Implementation
    7.1. Project Scope and Execution Strategy Development
Venue: 2020 AACE International Conference & Expo

Abstract: Owners executing large-scale projects frequently receive extensive planning data from contractors. Traditionally, project plan collection is an intensely manual process, involving a mix of scheduling tools, spreadsheets, and email. A significant portion of this time-consuming procedure includes the often-manual review of contractor schedules for quality and reasonableness prior to incorporating them into the project’s integrated master schedule. Some environments are so complex that the goal of a truly integrated plan is either unachievable or unavailable until mid-project. To address this problem, five owners have been surveyed and benchmarked, with their planning data communication management processes aggregated into three general categories. By combining the high-points of their collective wisdom with emerging practices, the writer proposes a high-maturity method to enhance efficiency in the planning and scheduling process.

(PS-3401) Crashing the Schedule Without Losing Track of Reality

Author(s)/Presenters(s): Jarod M. Maloney
Level: Basic
TCM Section(s): 9.2. Progress and Performance Measurement
    7.4. Resource Planning
Venue: 2020 AACE International Conference & Expo

Abstract: Projects often run late, either due to work variances or predictions of the impact of future risk events. In both cases, in order to meet commitments, the schedule must be crashed in an attempt to accelerate remaining work to recover from delays.

Traditionally, project acceleration is an arduous trial-and-error process, with the team accepting the first version of a modified plan that meets the target dates. Often, this crashing process causes significant collateral damage to the schedule in terms of unrealistic expectations of concurrent work, significant reductions in float, and overworked team members.

This paper reviews commonly utilized methods for crashing schedules, their strengths and weaknesses, and outlines best practices for project acceleration. Emerging methods in schedule optimization can take into account feasible work schedules and sensible activity durations to ensure an accelerated plan does not lose track of reality.

LIVE WEBINAR! (PS-3427) Successful Design Scheduling
Abstract: Delays often originate within the Architectural and Engineering (A/E) design effort, and the schedules developed to plan, organize, and monitor design tend to be high-level and not very effective to accurately model the work at a level of detail that allows for on time, on budget and with quality completion. When the schedule does not provide the right level of detail or complexity, its value for monitoring is limited. Sometimes there is even a failure to recognize the difference between consumed hours and progress. Failure to use the right schedule can lead to performance issues resulting in late design delivery, over budget delivery, or poor quality design delivery or any combination thereof.

A well designed and managed A/E design schedule promotes quick and accurate updates, supports proactive analysis to minimize delays and claims, and aligns with other project controls functions to enable integrated cost-schedule-risk design scheduling.

The authors, working for firms that provide engineering design services, have experience in working with the designers to develop the right level of detail for the design portion of a project, to establish a stage-gate approach to design milestones so they can align with cost, schedule, and risk monitoring, and so performance can be accurately measured. The authors bring a wide range of perspectives, from process engineering design scheduling, to design-build A/E scheduling, to construction manager (CM) agency A/E monitoring, to CM at risk A/E support scheduling. This paper will offer a proven approach that demonstrates guidelines for schedule design, development, monitoring, analysis, updating, and reporting, as well as set the benchmark to facilitate mitigation when necessary.

(PS-3428) Ramifications of Owner’s Baseline Schedule Approval Decisions

Abstract: Just when a team thinks that a project is smooth sailing in its early stages, a critical deliverable is missed... now what? While many owners and scheduling specifications have requirements for owner approval of contractors' baseline and update schedules, too often there is concern about possible risks associated with approval, or approvals are simply ignored. Sometimes specifications require 'approval', sometimes 'review', sometimes they mention 'acceptance', occasionally they simply address a 'record submission'. Often the concerns are related to the worry that review might 'direct' the contractor to a specific means and methods that could be problematic for the owner later if the project runs into delays related to the means and methods employed.
Studies show that one of the traits of project success is the involvement of the management team (Owner, Project Controls Group, Construction Manager and Contractor Management staff) in schedule review. [1] This paper discusses the different review and approval options for owners and makes recommendations for the appropriate level of approval, including discussion of the benefits and risks of any approach. The reasons for schedule rejection are discussed, as well as recommendations for requirements that tend to improve the chances of receiving an approved schedule.

Working for a top-50 program management firm, the authors have dealt with the issues of drafting scheduling specifications and schedule approval. They bring an extensive depth of experience in scheduling and schedule review, through working with contractors, consultants, and owners.

**When is a Baseline Not a Baseline? Problems and Solutions of Using the P6 Baseline Function**

**Author(s)/Presenters(s): Beatrice Nasui; Ronald M. Winter, PSP FAACE**

Level: Intermediate
TCM Section(s): 7.2. Schedule Planning and Development  
9.2. Progress and Performance Measurement  
Venue: 2020 AACE International Conference & Expo

Abstract: Many people interchangeably use the phrases “project schedule baseline” and “P6™ baseline schedules”. Fundamental differences exist between the project baseline and the baselines that P6 uses and these differences can cause significant confusion. The project schedule baseline is the point of reference and the basis for earned value measurements whereas P6 baselines are just snapshots of schedules in time.

The fact that any P6 project snapshot can be easily assigned as a “baseline” brings with it inherent risks. What if the snapshot attached as a project baseline is inadvertently changed? The variance analysis and earned value measurements would be flawed.

Moreover, the fact that the P6 baselines can be modified and updated so easily is both a blessing and a curse. What baseline schedule is actually being referenced and what are the earned value measurements based upon: the original baseline, current baseline, or something in between? It is necessary to ask how the baseline assignment process can be made more transparent.

Oracle doesn’t make the scheduler’s life easier either. The snapshots are supposed to be “images” frozen in time. However, this is not totally true, as some changes in the active schedules also affect the attached snapshots. What fields are affected? What does this do to the variance analysis? This paper addresses these questions.

**Understanding and Reviewing Construction Schedule Vital Factors (KPI’s)**

**Author(s)/Presenters(s): John Jackson; Melissa Wallace**
Level: Basic  
TCM Section(s): 9.2. Progress and Performance Measurement  
10.1. Project Performance Assessment  
Venue: 2020 AACE International Conference & Expo

Abstract: With the variety of schedule review techniques available to schedule reviewers and analysts, it is difficult to know and implement the most reliable and effective way to review a construction schedule and arrive at a clear indication of project status and schedule trends. In this paper, a process of reviewing construction schedules that follows a collection of vital factors that should not be overlooked in a schedule review will be outlined. Following these guidelines will provide the basis for an effective approach to monitoring progress and issues in construction schedules.

(PS-3486) Writing the CPM Specification to Support the Writer  

Author(s)/Presenters(s): Dr. Fredric L. Plotnick, Esq. PE  
Venue: 2020 AACE International Conference & Expo

Abstract: The CPM specification is often "cut and paste," usually not understood by the specifier, and almost always does not provide the specifier what is most desired - additional assurance that the project can (and hopefully will) be completed on time. This paper discusses technical, grammatical and legal issues relating to a specification to support this goal. The specification submittal may be considered a shop drawing of the plan of execution of actor or contractor and associated analysis. The specification should instruct how to prepare the pure logic network and accompanying calculations. It should not direct the actor to perform but rather elicit how the actor intends to do perform scope elsewhere specified. Separate sections of the specification best address how the submittal may be used to facilitate payment, be discussed in meetings, or aid in evaluation of the impact of changes or other unforeseen circumstances. Considerations of technical correctness, legal enforceability and how this section fits within the entire specification and contract will also be discussed.

(PS-3493) Improve Planning and Decision-Making Using Advanced Schedule and Reporting Management  

Author(s)/Presenters(s): Amy C. Nelson; Siddharth Patel; Satinder S. Baweja, CCP  
Level: Intermediate  
TCM Section(s): 11.3. Information Management  
Venue: 2020 AACE International Conference & Expo

Abstract: Construction firms usually focus on building the project. Recording events, tracking constraints, and monitoring progress often take a back seat. Therefore, opportunities to use available data, even when unstructured, is lost. Firms lose their ability to gather and study information, thus reducing their effectiveness in project planning, decision-making, and predictive analysis.

The value of schedule management must be improved before project planning and decision-making can be enhanced. Many firms keep multiple schedules that are out-of-sync, and so the potential of detailed planning and a well-constructed master schedule is missed. Improving the collection and integration of
meaningful data while updating a single master schedule allow firms to anticipate and provide insight into costly project issues and assist with planning current and future projects. Data can then be correlated in easy-to-analyze reports to improve project execution.

By using data from real-life projects, this paper demonstrates how these reports and analysis have been proven to assist in multiple ways, including change-order requests; weekly reporting on progress; identifying key project issues; analyzing internal issues vs. external issues; identifying progress impact trends, and developing predictive analytics to identify future trends.

(PS-3496) Interpreting Logic Paths in Multi-Calendar Project Schedules

Author(s)/Presenters(s): Thomas M. Boyle, PE PSP; Patrick M. Kelly, PE PSP

Level: Advanced
TCM Section(s): 7.2. Schedule Planning and Development
9.2. Progress and Performance Measurement
Venue: 2020 AACE International Conference & Expo

Abstract: Oracle’s Primavera P6 Professional Project Management scheduling software remains the dominant package in construction scheduling in North America, and features introduced by this software often become lingua franca between schedulers and schedule analysts. Such has been the case with the multiple float path calculation that Oracle includes in its P6 software.

Oracle’s documentation states that the multiple float path module of P6 calculates a “most critical path” and “sub-critical” paths, ranked in order of “criticality” by the float path value. An earlier study demonstrated the limitations of such analyses in single-calendar project schedules.

This paper extends the prior study to address float path assignments in project schedules with multiple activity calendars and other complications. It attempts to unravel the detailed consequences of the various calculation parameters, identifying potential use cases and interpretations for each. In particular, it demonstrates conditions that lead to invalid multiple float path results. Finally, the paper illustrates cases where the relevant software documentation fails to support the observed analysis results and may therefore be inaccurate.

(PS-3554) Introducing a New Critical Path Concept: The Most Labor Manhours Critical Path

Author(s)/Presenters(s): Mostafa AbdelRazik, EVP PSP

Level: Basic
TCM Section(s): 7.2. Schedule Planning and Development
7.4. Resource Planning
Venue: 2020 AACE International Conference & Expo

Abstract: This paper is intended to begin a discussion about a topic often overlooked by project controls professionals. There are numerous definitions and descriptions of a schedule’s critical path, all of which
have their basis in the element of time. Critical path is used to analyze a project’s schedule performance and to evaluate the likelihood of meeting one or more schedule constraints of a project.

In addition to identifying and monitoring the time-based critical path, some analysis can be done to identify which logic path(s) contain a high degree of project resources. For instance, some schedules can have a logic path that carries over 50% of the project’s cost. This path may not necessarily have the duration to be “critical” in terms of time management, but it can have an impact on a project’s financial performance if not monitored properly. Therefore, it can be vital to identify and monitor the “most labor manhours critical path” separately from the conventional critical path.

This presentation and discussion of the “most labor manhours critical path” is intended to provide practitioners with the needed terminology to describe the logic path containing the most direct labor manhours. Moreover, the author intends to answer the question of whether this topic should be considered time management, or cost management, or a hybrid of both.

(PS-3555) A Practical Application of Identifying and Correcting P6 Corrupt Data

Author(s)/Presenters(s): Ronald M. Winter, PSP FAACE; Marina G. Sominsky, PSP

Level: Intermediate
TCM Section(s): 7.2. Schedule Planning and Development
Venue: 2020 AACE International Conference & Expo

Abstract: The integrity of the data in Primavera P6 database is important, but what does that mean in real life to a typical scheduler? Some issues relate to problems in the system, while others come imbedded in the schedule itself. Imbedded errors move with the schedule when it is copied or backed up, causing the error to propagate.

Parts 1 and 2 of the papers on corruption of P6 schedule databases relied heavily on the theory behind the process. This paper focuses on the practical manifestations of what a corrupt P6 schedule looks like and proper procedures how to repair it that any scheduler can perform. Issues such as scheduling errors are illustrated and why they matter to the average scheduler are explained.

The likelihood of Primavera P6 schedules having these corruptions is tested using an all-new, larger database. Updated benchmarks on P6 schedule database corruptions are presented in an easy to understand format. The issues pertaining to the overall system (which typically require IT intervention) are separated from those affecting individual schedules (that individual schedulers can fix).

LIVE WEBINAR! (PS-3584) (Presentation Only) Gap Analysis: Recommended Practices vs. TCM Framework

Author(s)/Presenters(s): Jessica Colbert, PSP; John P. Orr, PSP FAACE

Venue: 2020 AACE International Conference & Expo

Abstract: Over the last twelve months, the Planning & Scheduling subcommittee, led by its RP Coordinator, Jessica Colbert, has performed a gap analysis between the TCM Framework Section 7.2
Schedule Planning and Development and the AACE Recommended Practices (RPs) that currently reference that chapter and its sub-chapters. The AACE Technical Board has requested that all subcommittees prepare a similar gap analysis, an evaluation which has two ultimate goals: (1) to ensure that all areas of the TCM Framework are supported by and expanded upon with published, peer-reviewed recommended practices, and (2) to ensure that existing published recommended practices are coordinated and aligned with each other when they address the same subsection within the TCM Framework.

The gap analysis that has been performed to date by the P&S subcommittee addressed the first goal of this larger project and has successfully identified subsections of the TCM Framework Section 7.2 that are not covered by any currently published RPs. The subcommittee has also identified potential overlaps in content across existing RPs. In this presentation, the P&S Subcommittee RP Coordinator will present the process developed and utilized to perform the initial gap analysis, the findings of the evaluation for TCM Section 7.2, the challenges encountered, and their recommendations for future actions by all subcommittees within AACE International.

**RISK-3457) The Lewis and Clark Expedition's Integrated Cost, Schedule, and Risk Analysis**

Author(s)/Presenters(s): Robert G. Fatzinger, CEP; Adam James

Level: Intermediate
TCM Section(s): 7.6. Risk Management
3.3. Investment Decision Making
Venue: 2020 AACE International Conference & Expo

Abstract: Would the application of historical data and integrated cost, schedule, and risk analysis have improved the reliability of Thomas Jefferson’s initial estimate for the Lewis and Clark expedition in 1803? Using integrated analysis of schedule and cost risk to estimate the appropriate level of contingency reserves on projects continues to demonstrate improved results over the traditional methods. These methods are most often reserved for mega-projects and have not yet “trickled down” to the majority of those we estimate in industry. This paper seeks to examine the application of Recommended Practice 57R-09 to more common, phase-gate projects of moderate size, scope and complexity through lightweight, flexible Microsoft Excel modeling. The paper focuses on the use of historical data to inform cost and schedule uncertainty, capturing both the known and unknown risks inherent in the data- improving the speed, accessibility, and applicability of integrated cost, schedule, and risk analysis on the common project. To demonstrate the flexibility and applicability of these concepts, this paper explores the application of integrated cost schedule and risk analysis for the historical Lewis and Clark Expedition.

**(RISK-3479) Variability in Accuracy Ranges: A Case Study in the US and Canadian Power Industry**

Author(s)/Presenters(s): John K. Hollmann, PE CCP CEP DRMP FAACE Hon. Life

Level: Intermediate
Abstract: This paper presents a case study of the variability in accuracy ranges for phased project cost estimates in the North American power industry. The study sought to improve the participants’ understanding of risks and estimate accuracy for their major power generation and overhead power transmission projects. The study team also sought to verify the theoretical accuracy values in the relevant AACE International® recommended practices (RPs) for cost estimate classification. The team studied estimated cost by phase (i.e., classification) and final actual data from 40 projects (86 phased estimates) from 6 utility companies completed from 2008 to 2019 with actual costs from 7 million to 771 million (2019$US). Schedule data was also studied, but is not the focus of this paper. Greenfield and brownfield power generation and transmission projects from across the US and Canada were included. Comparisons of the findings is made with other published studies. This study used the same approach as (and general text is intentionally similar to) two Canadian hydropower and overhead power transmission accuracy studies presented at AACE conferences in 2014 and 2017.

(RISK-3492) Utilizing Scenario Planning on the Risk Assessment Exercise for High Complexity Projects

Author(s)/Presenters(s): Abbas Shakourifar, PSP, Micah J. Meads

Level: Intermediate
TCM Section(s): 7.6. Risk Management
Venue: 2020 AACE International Conference & Expo

Abstract: Across many industries, scenario planning is regarded as an important strategic planning method with a variety of use cases but in its basic form it is employed to create flexible long-term plans. The planning method combines given that are assumed about the future with key uncertainties and driving forces, identified by considering external and internal factors. The scenarios include plausible but unexpectedly important situations or complications that are subtle in the present but over time have the potential to create dramatic impacts on future events or strategies. This paper describes the utilization of the scenario planning method as an ad-hoc tool that compliments the SRA workshops. Following in-line with traditional project management processes, this planning method requires certain decisions to be made prior to identifying key uncertainties and plausible scenarios. Scenario planning creates the flexibility needed for thinking in a broader range of possible futures, enabling decision makers to understand and consider the full risk profile of programs and strategic plans more broadly.

(RISK-3524) Risk Assessment of a Pipeline Construction Project in Alberta During El Niño Year

Author(s)/Presenters(s): Mohamed Abdelgawad; D. Anthony Payoe; Guy Krepps, P.Eng.

Level: Advanced
TCM Section(s): 7.6. Risk Management
Venue: 2020 AACE International Conference & Expo
Abstract: Risk and uncertainty are inherent in all construction projects and can affect overall project objectives. One of the key challenges of building pipelines in Northern Alberta is weather delays; either due to extreme cold or late winter freeze. Building through muskeg terrain has its own challenges due to the need to have frozen ground to support the weight of heavy construction equipment and to minimize environmental disturbances. Constructing during an El Niño year adds further level of challenge attributed to the later winter freeze and early spring thaw. This paper presents a case study of pipeline construction during an El Niño year and is used to demonstrate the added value of using risk analysis. During this study, risk analysis was applied to assist management with assessing the probability of the contractor meeting the mechanical completion in-service date (ISD) and to adjust the execution plan. The same concept can be applied to future projects where the probability of meeting the ISD is continuously assessed and the execution plan is revisited to ensure successful completion of projects.

LIVE WEBINAR! (RISK-3540) Conditional Branching Models How Project Managers Typically React to Schedule Overruns

Author(s)/Presenters(s): Dr. David T. Hulett, FAACE; Michael Trumper

Level: Advanced
TCM Section(s): 7.6. Risk Management
Venue: 2020 AACE International Conference & Expo

Abstract: Project owners, project managers can be counted on to react to prospective schedule overruns by developing a “recovery schedule” that adds resources to try to make up time. However, analysts using Monte Carlo simulation typically model the current plan as if the manager will not react even if the schedule is jeopardized. This is not realistic. When simulating a project schedule, the analyst needs to represent the manager’s response to delays as if there is still time to recover the schedule. Conditional branching can represent the project manager’s response to a schedule event such as the detailed engineering’s finishing later than anticipated by adding resources to shorten the execution phase to claw back the impending schedule overrun.

During a Monte Carlo simulation conditional branching can test each iteration for missing a key finish date. In the case study, a conditional branch is modeled with 2 possible plans. “Plan A” is the original fabrication schedule, and “Plan B” is a recovery fabrication schedule. The paper describes the logic simulating having a Plan B conditional branching and some results that may occur.

(TCM-3331) Association of Engineering Design Quality and Project Performance

Author(s)/Presenters(s): Dr. James T. O’Connor; Jeyoung Woo

Level: Advanced
TCM Section(s): 7.1. Project Scope and Execution Strategy Development
Venue: 2020 AACE International Conference & Expo
Abstract: Engineering design quality affects the overall construction project performance in terms of cost, schedule, quality, and safety. Defects in engineering design deliverables, such as errors or omissions, can have strong and significant associations with construction phase rework. To better understand this association, the authors analyzed the Construction Industry Institute (CII) benchmarking data. The primary focus of this paper is to determine engineering design related variables through analysis of a CII benchmarking survey questionnaire, and to identify the variables that are significantly associated with construction phase outcomes. An analysis of variance (ANOVA) with Tukey post-hoc test was conducted to identify the most significant association between engineering design variables and construction phase performance. The authors identified three statistically significant associations: 1) the engineering design completeness impact on cost growth, 2) the objectives change impact on customer satisfaction, and 3) the impact of the remote office on engineering productivity during the engineering design phase. This study contributes to a better understanding of how to prioritize engineering design efforts in order to enhance overall construction project performance and to provide guidance for managing engineering design quality.

(TCM-3430) Cost Engineering Roles & The Project Lifecycle: Providing A Framework

Author(s)/Presenters(s): Nicole Johnson, CEP; Stephanie Kers; Dave Kyle, CCP CEP

Level: Intermediate
TCM Section(s): 1.2. Purpose and Uses of the TCM Framework
11.2. People and Performance Management
Venue: 2020 AACE International Conference & Expo

Abstract: Representatives of the AACE International Total Cost Management (TCM) Framework are often seen as experts on all things related to cost engineering. In reality, there are many working in the TCM domain that still do not understand every aspect of this discipline.

While it may not be necessary in an individuals’ role to understand how everything works in the realm of cost engineering, the disciplines have a responsibility to understand how each role fits into the larger arena. For instance, how does estimating impact scheduling? Why is document control so important to the change order process? Where does each role fit within the cost engineering function and why?

These are questions that can be answered by understanding what cost engineering really means and how each element within it is interrelated. This paper will provide a high-level framework of this interconnectedness and basic definitions of the roles within cost engineering with a focus on function, relationships and flow of information over the lifecycle of a typical project.

(TCM-3439) Building Cost Engineering Competence for Public Projects

Author(s)/Presenters(s): Mark C. Sanders, PE CCP CFCC PSP; Cristiam Castillo Ortiz; Mayli Salinas Luciano, PSP

Level: Basic
TCM Section(s): 2.3. Strategic Asset Management Process Map
Venue: 2020 AACE International Conference & Expo
Abstract: Far too many public projects are delivered over budget and late, too many fail to deliver their planned benefits, and some prominent researchers have argued that these failures are due to “strategic misrepresentation,” during the project selection and approval process. [1] Other researchers have argued that they are due to project complexity, improperly managed risk, and changes in scope definition after project selection. [2] Total cost management (TCM) encompasses both strategic asset management and project controls, and an evaluation of an organization’s cost engineering skills can identify gaps based on the TCM Framework. This paper presents a study of the cost engineering skills of owner organizations against the TCM Framework, identifies the most common competency gaps, and proposes corrective actions.

(TCM-3446) Integrated Project Controls

Author(s)/Presenters(s): Satinder S. Baweja, CCP; Lori D. Vidak

Level: Intermediate
TCM Section(s): 2.4. Project Control Process Map

7.1. Project Scope and Execution Strategy Development

Venue: 2020 AACE International Conference & Expo

Abstract: Project controls is the process involved with tracking, review, and management of information needed to meet desired performance objectives. Controls in project management terms can mean the collection of processes for schedule controls, cost controls, change management, and more.

On most commercial construction projects, one or all such controls are in place and practiced to some extent. However, the rigor of their management varies between companies and from project to project.

A critical missing piece on too many projects is the lack of integration between these processes. The reason often cited among general or specialty trade partners is that integrating is data-heavy and cumbersome and is overkill for most commercial projects. The result is an accepted level of inefficiency and apathy to the effect this condition has upon project delivery. Efficiencies achieved by using integrated controls are never measured or apparent. This paper discusses the need for a standard integrated control process for construction projects that achieves efficiencies greater in value than the dollars being spent to carry out these controls.

(TCM-3468) Integrating Procurement with Project Controls is Critical for Cost Management

Author(s)/Presenters(s): Christopher W. Ronak

Level: Intermediate
TCM Section(s): 2.4. Project Control Process Map

7.7. Procurement Planning

Venue: 2020 AACE International Conference & Expo

Abstract: Project controls needs real-time, accurate and complete project data to be truly effective. A significant percentage of the costs and activities of most construction projects, however, is commonly
held in the purchase orders and subcontracts owned by a separate procurement department. The challenge with this is, when project procurement is not a cohesive part of the project team, it introduces a disconnect and silo-effect that causes information delays, uncertainty and a lack of complete project visibility. This disconnect can be eliminated by integrating procurement directly into the project team and its project controls systems. This not only provides real-time cost visibility, it also delivers key data on accruals, vendor performance, vendor progress, vendor trends and forecasts. It additionally reduces legal risks that can arise due to knowledge gaps within a corporate procurement department that is not deeply familiar with the nuance of construction project procurement and contract management. This paper will explore the importance of tightly connecting project procurement with project controls to reduce risk and gain a complete, holistic picture of the project in real-time. The concepts are drawn from many years working with organizations delivering major projects and the tangible results of rethinking the project-procurement relationship.

**LIVE WEBINAR! (TCM-3503) Strategic Portfolio Management: Funding and Finance Methodologies**

*Author(s)/Presenters(s): H. Lance Stephenson, CCP FAACE; Robert Gerber*

*Level: Advanced*

*TCM Section(s): 2.1. Basis of Total Cost Management Processes  
2.3. Strategic Asset Management Process Map*

*Venue: 2020 AACE International Conference & Expo*

*Abstract:* In regards to strategic portfolio management and the project delivery world, most organizations have limited financial resources, making it increasingly difficult to support the execution of its capital portfolio programme. With this said, the authors of this paper provide some recommendations for the purpose of defining and implementing a methodology for supporting, and therefore improving, portfolio funding & financial development, implementation and administration. This paper further assists in providing the audience the necessary provisions for ensuring the effective and efficient use capital dollars by identifying opportunities for shared savings and improving cashflow utilization. This paper will provide readers with the following:

- Implementation of a funding & financial management approach that will assist in funding optimization and utilization of the overall portfolio of projects; continuing to provide a value-add to the organization and improve competitive advantage through short- and long-term cash flow management.
- An understanding of funding categorization and prioritization coupled with balancing commitments, spending and stewardship. This includes introducing techniques for funding long-term and high priority commitments while matching the needs for short-term and routine projects.
- A relevant portfolio hierarchy and process designed to support both top down funding and bottom up budgeting and contingency management for portfolios, programs and projects.

**(TCMA-3375) Enhancing Data Reliability in a World of Increasing Information**

*Author(s)/Presenters(s): Michael A. French, PE; Christopher W. Ronak; Nick Papadopoulos*

*Level: Basic*

*TCM Section(s): 10.4. Project Historical Database Management  
7.3. Cost Estimating and Budgeting*
Abstract: Thorough, reliable information is a necessary component for making sound decisions. While many sources of data are available in the construction industry, they can be difficult to obtain or may be inaccurate. Lately, companies have undertaken initiatives to compile past results, making the information available and usable for better predictions. Also, recently developed technological systems and tools are improving the quantity, quality, and timeliness of information available to the construction industry. Although past data sources and new tools are providing a wealth of information, a critical issue remains; ensuring the data is trustworthy. Creating a trusted historical database requires consistent, methodical data collection techniques, analysis, monitoring, verification, and normalization. While improving data quality is necessary for improving predictions, it can also better position companies to take advantage of upcoming machine learning and artificial intelligence (AI) capabilities. Developing proper strategies to ensure useful quality data can help improve tracking, decisions, and predictions related to future works.

**(TCMA-3437) Design Principles for Creating a Visually Appealing Dashboard**

*Author(s)/Presenters(s): Ashwini Jain, CCT CST*

*Level: Basic*

*TCM Section(s): 11.3. Information Management*

*Venue: 2020 AACE International Conference & Expo*

Abstract: Organizations have many professionals working on various data analytics initiatives. While the work of data professionals may vary from time to time, designing a dashboard is a common task for most of these individuals. A dashboard is a good way to provide insights ranging from a top-level summary analysis to detailed-level tracking. Often, however, data professionals struggle to fit a plethora of information in a dashboard because of the different requirements that come from various parts of an organization. This paper defines the 5 Ws and 1 H for designing an appealing dashboard and can guide data professionals in accommodating the needs of multiple people at various levels within the organization.

**(TCMA-3459) The Unit Price Process for Estimate Data Development and Benchmarking**

*Author(s)/Presenters(s): Peter R. Bredhoeft, Jr. CEP FAACE; H. Lance Stephenson, CCP FAACE*

*Level: Intermediate*

*TCM Section(s): 10.1. Project Performance Assessment*

*10.4. Project Historical Database Management*

*Venue: 2020 AACE International Conference & Expo*

Abstract: Effective project cost estimate preparation depends upon having reliable, competitive reference data. The data is used both for inputs to the estimate (i.e., the resources and their costs) and to develop metrics (usually ratios or factors that reflect cost estimating relationships or CERs) for quantitative validation (a quality assurance process) of the estimate outputs. Metrics are also used to benchmark and guide improvement of capital project system performance. Historical data collection,
analysis and use in project and project system benchmarking have been shown to correlate with better project outcomes. To achieve a reliable and useful data process, one must apply reliable methodologies to facilitate proper data collection and management.

This paper addresses two topics. First, it addresses database development including a process for data collection using a standard breakdown structure at an appropriate level of detail for use in benchmarking metrics development. Specifically, it outlines the use of the International Construction Measurement Standard (ICMS). [1] although other structures can be used. The database aspect also addresses an effective methodology for data collection and maintenance including data conditioning and normalization and capturing other project attributes including key quantities. This process can and should be used for both cost estimates and actual project data. Second, the paper defines the use of a key metric called “unit price” for estimate development reference and for estimate benchmarking. Unit cost data, i.e., ratios of cost to key quantities, is perhaps the most common metric used in cost estimates of all classifications. There are many metrics that can be used, but unit prices are often of most interest to estimators and readily understood. Particularly for contracts based on unit pricing for which the client has no insight into hours or cost breakdowns within the units. A more robust set of metrics and rounded estimate validation process is covered in a draft AACE RP currently in review.

(tcma-3462) Adapting Data Management Structures to Improve Performance in Post-Disaster Scenarios

Author(s)/Presenters(s): Susan Bomba; Aleshia Ayers; Lamis El Didi

Level: Basic
TCM Section(s): 3.2. Asset Planning
3.3. Investment Decision Making
Venue: 2020 AACE International Conference & Expo

Abstract: When organizations face disaster-response situations that trigger large-scale maintenance and repair work, their data management systems need to be able to adapt to a significant increase in work and often changes to capital portfolios. Many data systems are designed for steady-state work, from large capital portfolios to routine maintenance work on smaller scales. After a major disaster occurs, the priorities of the organization change, resulting in shifting resources, adjusted priorities for capital and maintenance work, and modifications to existing processes and procedures. In emergency situations, an added complexity includes oversight from government regulators requiring an increase in progress reporting and data requests, requiring standardized definitions among regions and programs. A key success factor in this effort is the adaptability and usability of the existing data management systems.

By improving the data management structure for post-disaster efforts, the general data (i.e. production rates, cost per repair, resources required per repair) can be used in future maintenance efforts to budget and forecast. Therefore, the data being created during these post-disaster situations becomes useful as a benchmarking and/or historic data tool. This paper will discuss strategies that help companies scale their existing tools and reporting during post-disaster periods in a way that can be leveraged for future benefit to the organization. A case study will present how a large public utility was able to adapt to a significant increase in repair work following a major disaster event and leverage the influx of information for long-term improvements to their asset management and capital planning systems.
LIVE WEBINAR! (TCMA-3502) Benchmarking for Competitive Advantage

Author(s)/Presenters(s): H. Lance Stephenson, CCP FAACE; Peter R. Bredehoeft, Jr. CEP FAACE

Level: Intermediate
TCM Section(s): 6.1. Asset Performance Assessment
10.1. Project Performance Assessment
Venue: 2020 AACE International Conference & Expo

Abstract: To improve and be competitive in terms of profitability (often measured by return on investment), companies must manage their operations and capital project delivery systems to drive improved cost and schedule effectiveness. This effort requires companies to improve their understanding of cost, schedule, risk drivers, and behaviors through historical data collection, analysis, and benchmarking. Subsequently, benchmarking will result in a more competitive project system.

While benchmarking for competitive advantage is usually seen as a strategic endeavor with respect to its overall capital or project system, benchmarking takes knowledge and understanding of both external and internal project system practices and performance to drive continuous improvement. The business uses benchmarking to improve its overall competitive position in capital project management with respect to organizational strategy, process management, tools development, and behaviors. Benchmarking also touches on or relates to other analytic processes at a project level. These relationships include project planning, performance estimate validation, and forensic analysis for achieving improved business objectives.


Author(s)/Presenters(s): Michael Lesnie

Level: Basic
TCM Section(s): 10.4. Project Historical Database Management
7.3. Cost Estimating and Budgeting
Venue: 2020 AACE International Conference & Expo

Abstract: This large-scale study, of more than 2,000 projects, looks at the project performance outcomes from two Australian utilities, each with large portfolios of small asset renewal projects. For each utility, the paper considers the relationship between budget cost efficiency, actual (achieved) cost efficiency and the predictability (deviation) between budget and actual cost.

(TCMA-3550) Scope Change Control – KPI: A Predictive Analytic’s Approach to Evaluate the Status of Progress, Time, and Cost

Author(s)/Presenters(s): Brahim Seddiki, CCP

Level: Advanced
Abstract: The key performance indicator (KPI) has become a vital tool for tracking an organization’s performance and outlining the effectiveness of its various functions and processes that are important for achieving an organizations goal. They are also known as KPIs or key success indicators. The paper will highlight and describe a methodology that will help build a comprehensive mathematical model based on historical data (cost, time, physical progress) using machine learning (supervised learning) to evaluate scope change control and measure performance for KPI purposes in a three-dimensional setup.