



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

(ADV-3726) Accelerating Disaster Recovery with an Integrated Smart City Model

Author(s)/Presenters(s): Yusa H. Battal; Robert Boys; Damon Armeni; Natalie Hutcheson; Naanzem Hoomkwap; Jodie Kim; Mark Blumkin

Level: Basic

TCM Section(s):

3.2. Asset Planning

10.2. Forecasting

Type: Pre-recorded presentation

Abstract: The traditional natural disaster recovery models and methods are focused on repairing and using existing engineering resources to resume operations in the fastest and safest methods available. However, there is unrealized value in improving our infrastructure by adding high tech features and strengthening structural integrity, though this is costly and requires long term complex engineering plans. This article aims to consider both methodologies and how an integrated approach could result in building resilient smart cities at a dramatically reduced cost just after natural disasters. An integrated approach would focus not only on resuming operations, reducing construction, repair, and economic distribution costs but also improving quality of life in high-populated areas that are prone to natural disasters. This paper reviews two approaches through a financial model: one rebuilding traditionally and another rebuilding as a smart city following the integrated approach, to justify the long-term benefits of building smart cities.

(BIM-3653) Application of BIM in Earned Value Management for Large-Scale Complex Construction Projects

Author(s)/Presenters(s): Xuejiao Liu; Chunfu Xu; Liqiu Kang

Level: Basic

TCM Section(s):

9.2. Progress and Performance Measurement

10.2. Forecasting

Type: Pre-recorded presentation



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Abstract: Large-scale construction projects need a large amount of investment and a long construction period for completion. It is critical for cost control of these projects to use earned value management. Large-scale and complex construction projects are often designed and constructed at the same time. BIM can reflect the design information of the engineering entity before the drawings published.

In this paper, concrete volume, room area, pipe length and other engineering data in BIM are applied to generate the planned value curve of the project and ensure its accuracy, and the earned value is compared with the actual cost reflected by BIM in real time. The follow-up cost trends and the EAC (estimate at completion) can be predicted accurately, which embodies the value of BIM application.

(BIM-3675) Using 4D Modeling to Perform Critical Path Analysis for Delays

Author(s)/Presenters(s): Christopher W. Carson, CEP DRMP PSP FAACE; Sadia Janjua, PSP; Wesley Beaumont

Level: Intermediate

TCM Section(s):

6.4. Forensic Performance Assessment

11.3. Information Management

Type: Live webinar

Abstract: Historically 4D modeling, which connects the physical 3D model to the time-dependent schedule activities, has been used primarily to compare the as-planned and the as-built condition, providing a visual comparison presentation that helps visualize the time difference in performance but provided no other analysis. Using the full power of a 4D model, this paper shows a practical process that provides critical path method (CPM) analysis to determine delay and the ramifications of delay. Instead of pages of tedious analysis development, this process shows direct delays to the critical and near-critical path including mid-period critical path shifts in the 4D model itself. The process demonstration uses an actual project with real project data to analyze and determine delays. This can be used in contemporaneous project analysis during the schedule update process as well as for after-the-fact forensic schedule analysis situations.

The authors have a strong depth of experience in CPM scheduling, building information modeling (BIM), 4D modeling, and virtual design & construction (VDC), having produced and used models for projects



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such as industrial plants, bridges, and buildings. They combine this BIM/4D/VDC modeling and CPM scheduling background with forensic analysis expertise to produce a useful and meaningful technique.

(BIM-3678) BIM+ Integrated Site Data Acquisition Model for Construction Projects

Author(s)/Presenters(s): Ali Montaser, P.Eng. CCP EVP PSP; Dr. Osama El Sayed Moselhi, P.Eng.

Level: Intermediate

TCM Section(s):

5.2. Asset Performance Measurement

10.2. Forecasting

Type: Pre-recorded presentation

Abstract: Tracking and control of construction projects depend primarily on the accuracy, frequency and time required to collect onsite data of construction operations. Manual data acquisition methods may not be reliable or complete, as they are contingent upon motivation, judgment and skills of site personnel capturing data. To address those challenges, this paper presents automated data acquisition framework and implementation software for integrated data acquisition in construction projects. The automated framework integrates Building Information Modeling (BIM) and automated site data acquisition technologies. It captures onsite data through several components. One component is done through an onsite person, equipped with a tablet PC that has the BIM of the project to provide visualized presentation. As well, the tablet PC includes data acquisition technologies to enable capturing data in real time. The tablet PC has barcode reader, RFID reader, GPS, Wi-Fi, Bluetooth and a camera. The developed framework and algorithms are implemented in prototype software BIM+. It is Two-Tier software, which utilizes an object-oriented BIM model. The paper reinforces this through applying the framework and the implementation software to real project case study.

(BIM-3682) Control+ Integrated Data Analysis and Reporting for Construction Projects

Author(s)/Presenters(s): Ali Montaser, P.Eng.; Dr. Osama El Sayed Moselhi, P.Eng.

Level: Intermediate



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(Subject to change–Rev. 2021-05-12)

TCM Section(s):

5.2. Asset Performance Measurement

10.1. Project Performance Assessment

Type: Pre-recorded presentation

Abstract: Earned value analysis (EVA) is used for reporting work progress and forecasting project status at completion. Critical to its reliable application is accurate and timely data for quantifying the earned progress. Traditional analysis and reporting methods place considerable load on project controls team due to the large amount of data that needs processing and the inter-dependency between the data. To address those challenges, this paper presents automated data analysis & reporting framework and its implementation software. The developed framework makes full use of building information modeling (BIM) to provide visualization and pertinent information of activities. The developed framework embraces the human factors to augment the visualization-information aspects and automated site data acquisition. The developed model demonstrates the significance of data fusion of a wide range of automated site data acquisition technologies and BIM. The developed framework and algorithms are implemented in prototype software Control+. It is three-tier web-based software for processing, analyzing, and reporting the captured data. The developed model can generate reports in different granularity (i.e. project, activity, object, and resource levels) and time windows (i.e. daily, weekly, and monthly). The paper reinforces this through applying the framework and the implementation software to real project.

(BIM-3692) BIM and Cost Estimation: What Will Change and What Will Remain the Same

Author(s)/Presenters(s): Fernando Valderrama

Level: Basic

TCM Section(s):

7.3. Cost Estimating and Budgeting

Type: Pre-recorded presentation

Abstract: The explosion of BIM has given rise to new real possibilities for improving the economic management of construction. Changes appear in traditional processes and roles, but new agents also enter that place BIM as an objective in itself, instead of just another component of project management. The paper develops the impact of BIM on cost estimation, showing with real examples the changes that



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(Subject to change–Rev. 2021-05-12)

are taking place. It also suggests how to take advantage of the new environment to improve processes and describes the knowledge and skills that will continue to be needed in construction management, no matter what happens with technology.

(CDR-3613) Weather Impacts and Loss of Productivity Claims

Author(s)/Presenters(s): Tong Zhao, PE PSP; J. Mark Dungan

Level: Intermediate

TCM Section(s):

6.4. Forensic Performance Assessment

10.1. Project Performance Assessment

Type: Pre-recorded presentation

Abstract: Labor productivity is susceptible to many affecting factors which can cause loss of productivity, and weather is one of them. Depending on the root causes, weather impacts can be categorized as contractor risk impacts, which should have been reasonably anticipated by the contractor; excusable, but non compensable impacts; or excusable and compensable impacts. Loss of productivity is one of the most contentious subjects in construction disputes; and proving a loss of productivity claim for weather impacts can be very challenging. Because of its importance, the subject of weather impacts to labor productivity has received considerable attentions in research in the last half century. This paper reviews the research on weather impacts to labor productivity and then discusses loss of productivity claims related to weather impacts from the aspects of entitlement, causation and damage quantification. This paper provides tips for contractors to prove loss of productivity claims for weather impacts, and also provides suggestions on the prevention, mitigation and management of those claims, especially for inexperienced owners.

(CDR-3621) Challenges in Selection of the Most Defendable Method Implementation Protocol (MIP) as Recommended by AACE RP 29R-03 in Case Study of Two Project Schedules

Author(s)/Presenters(s): Saeid Khademagha, P.Eng.; Abbas Saifi

Level: Intermediate



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TCM Section(s):

6.4. Forensic Performance Assessment

10.1. Project Performance Assessment

Type: Pre-recorded presentation

Abstract: Major construction projects, due to their increasing complexity - especially those involving rehabilitation and renovation - may undergo considerable deviation from the baseline schedule over the project life cycle. With the recent intensification of delay analysis clauses in public sector projects contracts, presenting the most defensible forensic schedule analysis supported by an accurate evaluation of the time and cost impacts of the delay is becoming increasingly crucial. One of our clients, publicly funded, has recently changed its contractual requirements for the delay analysis by adding the following clause to its RFP documents:

"a request for extension of time must be submitted and supported by a schedule delay analysis using a method defined in AACE International Recommended Practice 29R-03 - Forensic Schedule Analysis (dated April 25, 2011). ..." This paper focuses on the case study of two projects, and highlights the approach in selecting the most defensible delay analysis method based on the AACE International Recommended Practice No. 29R-03.

(CDR-3622) Timing Your Time Extensions and General Conditions Costs

Author(s)/Presenters(s): Brian J. Furniss, PE PSP CFCC; Matthew G. Nichols, PSP

Level: Basic

TCM Section(s):

2.4. Project Control Process Map

Type: Live webinar

Abstract: Resolving time extensions and extended general conditions are challenging issues for contractors, subcontractors, and owners. Submission timing is often key to resolving a time extension favorably, and if there is no resolution, that timing may be important to preserving one's ability to successfully resolve a claim.

Further complicating resolution are the different methods available for quantifying extended general conditions costs and how general conditions may vary over time. Using the costs incurred during the delay period may yield very different results than using the costs at the end, or tail, of the project. This paper will provide a brief introduction on how the timing of time extensions is crucial for successful



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(Subject to change–Rev. 2021-05-12)

resolution of change orders and claims, and will also provide recommendations for how to accurately price extended general conditions costs in various project scenarios.

(CDR-3650) Allocation Methods for Direct Costs on Large Projects

Author(s)/Presenters(s): William C. Schwartzkopf; Peter Armstrong

Level: Intermediate

TCM Section(s):

6.4. Forensic Performance Assessment

7.3. Cost Estimating and Budgeting

Type: Pre-recorded presentation

Abstract: Indirect costs on large, multiyear, heavy civil projects and process power projects are a significant part of project cost which can often exceed 20% of total project costs. Understanding the cost drivers for the different categories of indirect cost and appropriately allocating them is important for understanding how these costs can change; determining the cause of the change when appropriate; and recovering the costs when they are caused by additional or changed work for which the Owner or others are responsible. Indirect costs include the costs for such items as staff; quality assurance and quality control efforts; craft support; personal protective equipment; small tools; and expendables. These types of costs are often assumed to be time-related without any analysis. When the costs are analyzed, the costs are frequently driven by direct labor hours or direct labor costs. The more appropriate method is often to allocate these costs on a cost-per-direct labor hour basis. This paper will review the methods of using such a cost allocation method and substantiating that direct labor hours or direct labor costs are the cost driver.

(CDR-3684) Cost Assessment Model for Schedule Recovery due to COVID-19 Event in China

Author(s)/Presenters(s): Lan Zhang; Ruifu Zhou

Level: Basic

TCM Section(s):

10.3. Change Management



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(Subject to change–Rev. 2021-05-12)

Type: Pre-recorded presentation

Abstract: The COVID-19 started in the January 2020 that caused the short term pause and difficulty of personal, equipment, materials flow in China and the event is labelled as "Force Majeure" where in the contract specified out that in waive of the responsibility of the contractor due to the condition changed. In order to recover the schedule, the Client will negotiate with the contractor to reach a revised schedule at a reasonable price tag that will be agreed by both parties. Since there is no cost increase model available in the market that can give both parties to follow, communicate and settle. The study starts with the direct impacts on the baseline schedule per "fish bone" model to have a COVID impact schedule. Then, pull back the schedule per Client's desired completion dates by adding resource on the critical path. Price those activities to counter the COVID and activities to recover the schedule, add them up to develop the cost assessment model (CAM) for the schedule recovery. The model then is applied and illustrated at a semi-conductor project in China and the result demonstrates the CAM is effectively streamline distributes between two parties and is a good tool to align the recovery schedule at a reasonable price to deliver the project with confidence.

(CDR-3697) A Decision Tree Approach for the Analysis of Construction Delay Claims

Author(s)/Presenters(s): Dr. Hendrik Prinsloo

Level: Basic

TCM Section(s):

6.4. Forensic Performance Assessment

Type: Pre-recorded presentation

Abstract: Delays to contractors' progress, often resulting in time and cost overruns, are a major source of claims and disputes in the construction industry. The assessment of extension of time (EOT) claims as part of a construction project can have far-reaching consequences for the financial success of the project. The proper and transparent assessment of EOT claims is therefore an essential component in the success of any project. In the study an action-research approach, a very specific qualitative approach, was followed to develop a user-friendly guideline, to assist practitioners to navigate this potential minefield of complexities in the process of the assessment of EOT claims. Focus groups, consisting of industry practitioners, with specialist knowledge in construction contracts, contributed to the development of the decision-support frameworks, and ultimately to the findings. The iterative



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(Subject to change–Rev. 2021-05-12)

process followed assisted in producing a tool that can be used in practice as a guideline for the analysis of EOT claims.

(CDR-3711) There is No Such Thing As a Free Non-Work Day

Author(s)/Presenters(s): Cory R. Milburn, CCP CFCC PSP; Khaled M. Aziza, EVP PSP

Level: Basic

TCM Section(s):

10.1. Project Performance Assessment

10.3. Change Management

Type: Live webinar

Abstract: Although the majority of construction contracts define the performance duration in calendar days, another common method for defining the period of performance is to establish a workday duration for the project. In the absence of a time extension, contractors are generally required to complete the work within the workday duration established by the contract. To address certain project delays, the owner may grant, or the contractor may request a non-workday. Furthermore, the owner and the contractor may view the granting of non-workdays as an alternative to granting time extensions. Unless otherwise specified, non-workdays are treated as excusable, non-compensable delays, wherein the owner and contractor bear their own respective costs that result from the delay. Therefore, there is no “free” workday, and the owner and contractor should closely review the accounting of non-workdays and workdays during the progression of the project. With the examination of two case studies, this paper highlights issues that should be considered by both contractor and owner before granting or accepting the designated non-workdays to avoid disputes.

(CDR-3719) Concurrency's Role in Assessing Construction Delay Claims

Author(s)/Presenters(s): Brenton Sadauskas, PSP; Russell H. Wodiska, EVP

Level: Intermediate

TCM Section(s):

6.4. Forensic Performance Assessment

Type: Pre-recorded presentation



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(Subject to change–Rev. 2021-05-12)

Abstract: Concurrency, or the concept of concurrent delay, is often used as a defense when either the owner or contractor is identified as causing a delay. Yet the concept is rarely defined in construction contracts. This can cause confusion when the same contract is specific regarding the type of forensic delay analysis required when awarding an excusable and/or compensable time extension.

While this failure to address concurrency in the contract can lead to varying opinions and disputes on how best to correctly apply the concept, its absence from contracts may surprisingly lead to superior forensic results. This paper addresses the risk of incorporating concurrency definitions in contracts, provides an unbiased framework for measurement, and demonstrates the differences in allocations of responsibility between those contracts that address it directly and those that do not.

It will be demonstrated that proper critical path method (CPM) scheduling, with regular interval updates, allows for a forensic delay analysis that fully assesses concurrency. Evaluating contemporaneous delays on an update-to-update (same period) basis utilizing the concept of primacy of delay results in a defensible and accurate forensic analysis that removes much of the judgment often proffered when evaluating construction delays.

(CDR-3732) "Concurrent Events" and Other Scheduling Issues in the News

Author(s)/Presenters(s): Christopher J. Brasco, Esq.; Matthew D. Baker, Esq.; Dakus Gunn

Level: Advanced

TCM Section(s):

6.4. Forensic Performance Assessment

9.2. Progress and Performance Measurement

Type: Live webinar

Abstract: In recent years, project stakeholders have increasingly embraced both scheduling techniques and contractual provisions to tilt the playing field in their favor in disputes involving concurrent delay. These developments have shifted the legal landscape and make it more important than ever to evaluate how a particular contract will affect a party's rights in connection with project delays. This paper considers common technical and legal concurrent delay flashpoints, the emerging trend of using scheduling techniques and contractual provisions to determine the concurrency conundrum, and insights learned from recent court decisions applying such provisions.



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(CDR-3743) The Top Ten Mistakes Made In Forensic Analysis

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

Level: Advanced

TCM Section(s):

6.4. Forensic Performance Assessment

7.2. Schedule Planning and Development

Type: Live webinar

Abstract: Project team members and experts are not always accurate in how they analyze a project's forensic history. These inaccuracies range from using incorrect analysis methodologies to “cherry-picking” only data that supports their case and everything in between. These mistakes are common and happen for many different reasons. They can be due to an analyzer not having enough experience or they can be made purposely in an attempt to mislead someone.

The authors will discuss ten biggest mistakes made in forensic analysis today and how to recognize and confirm that each is in fact mistake. In addition to the identification, the paper will also discuss the proper way to perform each analysis where the mistake was made, using lessons learned from project controls, forensic analysis/dispute resolution experience, and AAACE's recommended practices.

These top ten mistakes will be discussed in ascending order of importance starting with least important, but the authors believe that all ten are vital to avoid when performing a forensic analysis.

(CSC-3609) Causes and Impacts of Delay in Construction Project in Saudi Arabia

Author(s)/Presenters(s): Mossab Abbas Elkhidir, Sr. CCP

Level: Basic

TCM Section(s):

7.6. Risk Management

Type: Pre-recorded presentation



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

Abstract: This paper aims to study and analyze the main causes and impacts of construction projects delays in Saudi Arabia. This delay is a common concern worldwide, as it has significant impacts on the engineering and financial aspects of projects. To carry out this study, relevant data were collected from related sources including 88 contractors, 42 consultants and 25 clients (total of 155 source of information in a form of questionnaire responses), the data were then assessed and analyzed obtaining 33 causes and 6 impacts of projects delays. The identified causes and impacts were found to be related to all different types of the construction projects. The study results indicate that there are three main causes of delays in construction projects:

1. Poor project scheduling and planning from the contractor's side,
2. Inability of the contractor to implement financial planning and;
3. Lack of supervision and monitoring on site by the contractor.

Consequently, these delays are responsible for affecting the parameters of costs and time in construction projects substantially. The survey results also found that there are high correlations between the client and consultant causes and weak correlations between client and contractor causes. And there is different correlation which is considered a huge correlation between contractor causes and the impacts. The survey also explained that 19.0% of the projects in Saudi Arabia are considered to be overdue and 19.2% are considered to be over budgeted.

(CSC-3620) High-Confidence Methods for Assessing Complex Project Time and Cost

Author(s)/Presenters(s): Abbas Saifi; Saeid Khademagha, P.Eng.

Level: Intermediate

TCM Section(s):

7.2. Schedule Planning and Development

Type: Live webinar

Abstract: The dynamics of the current infrastructure projects have changed significantly. With the increase in the complexity of the projects and the project life, the risks associated with such projects have multiplied. There are now more factors than ever before to erode the confidence of key stakeholders. The burden of shoring up that confidence among the stakeholders traditionally has fallen on the contractor's project proposal and management team. To aid them in this effort, owners and their consultants have increased their demand for assessments of all project schedule submittals. This paper



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provides an in-depth analysis on the advantages and disadvantages of such assessments, with the author's recommendation on which assessments best instill confidence in construction project time and cost.

(CSC-3683) Cost Control Model for a Medical Facility in China

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

Level: Basic

TCM Section(s):

2.4. Project Control Process Map

8.1. Project Control Plan Implementation

Type: Pre-recorded presentation

Abstract: When North America investors build their facility in China, it is common that the project are overrun in the cost. One of the reasons is the Contractor adopts the "low bid, high claim" strategy. How to keep the cost under the budget? The traditional control model is to set a contingency funding to cover the cost changes and claims from the contractor which always results the cost overrun at the end. A dynamic cost control model (CCM) might solve the problem. This paper starts client's procurement strategy based on the supply chain theory that the client shall select the most suitable and able contractor to build the facility at a competitive price. Then, based on the Process Diagram from PMBOK, a Client's Cost Control Model is developed, follow by a case study. A good procurement strategy such as bid out for general contractor, direct purchase major equipment and performance packages will ensure the quality and also obtain a competitive price that result significant saving that could be utilized to cover the cost changes and possible claims from the contractor. A fair and transparent evaluation and communication with the contractor on monthly basis and the settlement that presented in the model will keep the project under the budget. The CAM might be a useful tool for the client to control the cost.

(CSC-3710) Exploring the Effectiveness of an Independent-Integrated Project Controls Group - A Case Study

Author(s)/Presenters(s): Lipika Swarup; Dr. Erica Cochran Hameen

Level: Intermediate



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

TCM Section(s):

2.4. Project Control Process Map

10.1. Project Performance Assessment

Type: Pre-recorded presentation

Abstract: Project controls should be an independent auditing group that reports on project and team performances and predicts remaining cash-flow and resources. Ideally this group must work along-side project managers to gain valuable insight while maintaining an objective viewpoint. The need to maintain objectivity towards performance is paramount as the distributed analysis is then used by organizations to take strategic business decisions.

However, in industry, it has been observed that the project controls groups either report to project managers or are structured under the accounting departments. Additionally, the groups are either relegated to only schedulers or, separate individuals are given responsibility for scheduling and cost analysis. These are inherently flawed systems as 1) they allow the project managers to influence analysis and 2) due to communication lapses schedulers and cost analysts often get siloed; thus, providing subpar analysis.

As a response to this gap, this paper with the help of a case study reaffirms the requirement of keeping project controls as an independent team and strongly advocates integrating scheduling and cost analyst roles. Further this paper initiates the conversation about competencies of project controls personnel and discusses the difficulties in implementing the shift of the team from a sub-group to its own independent entity.

(CSC-3734) A Case Study in the Rapid Deployment of New Forecasting Algorithms on a Large Tollway Construction Program

Author(s)/Presenters(s): D. Andy Keels; Richie Walker, PSP

Level: Intermediate

TCM Section(s):

6.1. Asset Performance Assessment

Type: Pre-recorded presentation



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(Subject to change–Rev. 2021-05-12)

Abstract: The COVID-19 pandemic resulted in commercial and personal vehicle traffic volumes declining drastically over the course of a few weeks in the spring of 2020. For highway agencies that rely on toll revenue as a substantial part of their funding, this rapid reduction in revenue presented a potential impending liquidity crisis. Agencies with large construction programs underway were forced to balance ongoing cash needs to support those projects with both a drop in revenue and a level of economic uncertainty likely not seen in over a decade. The need for frequent updates of projected progress on large capital programs became critical in order to constantly re-evaluate cash position, changing revenue projections and both short term and long-term impacts.

This paper will present solutions that were developed to provide rapid forecast updates when they could not be produced within the constraints of existing tools and systems that had been configured to measure progress over an annual or quarterly timeframe. Suddenly, weekly updates were needed. Using an open source statistical programming language, a methodology was created that allowed for time phased forecasts to be provided to program stakeholders each week on over 300 projects totaling over \$1 billion of annual spending. Robust and flexible forecasting algorithms based on evolving information, historical progress data and the latest exploratory data analysis (EDA) were developed and applied to continue successfully managing a \$14 billion capital program.

(CSC-3768) Practical Approach on Resource and Cost Loading a Project Schedule

Author(s)/Presenters(s): Gino Napuri, EVP; Mir M. Ahmad, PSP

Level: Basic

TCM Section(s):

7.2. Schedule Planning and Development

7.4. Resource Planning

Type: Pre-recorded presentation

Abstract: Does every project schedule need to be resource and cost loaded? The concept of resource and cost loading a project schedule could be mystifying for some. Being able to identify the proper level of resource and cost loading a schedule proportional to the scope of a project can also be challenging. Furthermore, managing stakeholders that are not educated in project controls can get confused with the terminology, i.e., what is the difference between resource loading vs. cost loading?

Early in a project there is a natural desire to acquire as much information as possible from each other. The client wants to oversee the project planning while the contractor is adapting to the expectation of



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(Subject to change–Rev. 2021-05-12)

the client. During these times, one of the key decisions is to try to identify which part of the contract the client will expect the contractor to adhere word by word and which parts can be negotiated out and amended.

Ideally, the stakeholders can decide on the need to develop the schedule beyond start, finish activities, and link relationships within them. If this is not done early, there is a high risk of failure as the team switches focus from planning to execution, leading to disregard the contract requirements. Resource and cost loading the schedule could be negotiated to be removed from the requirement or can be potentially forced by the client and their representative creating a challenging environment for the team. This paper focuses on this challenge and proposes the best approach from experience.

The authors have experience in large program scheduling with resource and cost control and have developed a workable and efficient method of handling projects, following the AACE TCM Framework and recommended practices.

(DEV-3686) (Panel Discussion) Career Stories in Planning and Scheduling

Author(s)/Presenters(s): Avi Sharma; Abdelhady Ossama Hosny; Jermaine A. Allen, PSP; John A. Armstrong, PSP; Santosh Bhat, PSP

Level: Basic

TCM Section(s):

11.2. People and Performance Management

Type: Pre-recorded presentation

Abstract: This panel discussion will be a wide-ranging conversation led by the Rising Professionals Committee with a panel of seasoned planning and scheduling professionals about their careers in the industry. The expert panel carries varied experience in the engineering, oil, and gas, and construction industries and represents the perspectives of owners, consultants, and contractors. Discussion topics for the panel will include their own professional journey and career path, advice for young professionals, lessons learned along the way, and how the industry has changed over time.

(DEV-3687) Expected Competencies of Graduate Quantity Surveyors Working in New Zealand



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Author(s)/Presenters(s): Kam Yuen Cheng, CCP; Meng Yan

Level: Basic

TCM Section(s):

11.2. People and Performance Management

Type: Pre-recorded presentation

Abstract: In New Zealand, all sixteen polytechnics are undergoing a merging process into one institute – Te Pukenga (New Zealand Institute of Skills and Technology) and currently, different polytechnics have their own curriculums of quantity surveying/cost engineering, thus there is an urgent need to standardize. The building construction industry evolved significantly in New Zealand in the past few years, especially to address new technologies, e.g., building information modeling (BIM), drone technology; and there are more international construction contractors participating in the domestic New Zealand market. To ensure that quantity surveying education is keeping pace with the market demand, the purpose of this study is to identify the gap between the competencies of graduate quantity surveyors and the expected competencies that the New Zealand construction industry is looking for. Eventually, the study provides information about the industry's current trend leading to review of quantity surveying education and updating of the corresponding curriculum.

- Design/methodology approach - A hybrid approach including desk review and a questionnaire survey will be adopted. A comparative analysis identifying differences between two competency levels will be prepared.
- Practical implication: The findings reveal the need for designing a quantity surveying program that caters for industry needs to ensure graduates are capable to carry out the cost engineering tasks that industry expects.

(DEV-3688) (Panel Discussion) Career Stories in Cost Engineering

Author(s)/Presenters(s): Gregory J. Whiteside, PE CCP; Michael Bensussen; Kenneth R. Cressman, CCP EVP; H. Lance Stephenson, CCP FAACE; Lipika Swarup

Level: Basic

TCM Section(s):

11.2. People and Performance Management



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Type: Pre-recorded presentation

Abstract: This panel discussion will be a wide-ranging conversation led by the Rising Professionals Committee with a panel of seasoned cost engineering professionals about their careers in the industry. The expert panel carries varied experience in the engineering, oil, and gas, and construction industries and represents the perspectives of owners, consultants, and contractors. Discussion topics for the panel will include their own professional journey and career path, advice for young professionals, lessons learned along the way, and how the industry has changed over time.

(EST-3601) Engineering Manhours Estimation for a Process Plant

Author(s)/Presenters(s): Atiq Akbar Shaikh

Level: Basic

TCM Section(s):

7.3. Cost Estimating and Budgeting

Type: Pre-recorded presentation

Abstract: In today's competitive world, it becomes important for companies to accurately estimate engineering manhours to make bids profitable and to successfully manage the project. Bottom-up estimating is the most accurate approach of estimation. It involves estimation at the lowest level of detail, which requires good knowledge of work to be carried out by various engineering disciplines.

This paper lists activities carried out by engineering disciplines involved in an engineering & procurement (EP) technology package contract for an LNG project. The paper also gives an insight on activities parameter that demonstrates a measurable relation with engineering manhours.

Each organization has its own tools and techniques, so the hours may differ from one company to another and hence have not been mentioned anywhere in the paper, however, the engineering activities for any process plant remains the same and hence by applying the information mentioned in the paper, one can accurately estimate engineering manhours.

(EST-3632) Building Interactive Conceptual Cost Estimate Model



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

Author(s)/Presenters(s): Flora F. Koester, CEP

Level: Basic

TCM Section(s):

7.3. Cost Estimating and Budgeting

Type: Pre-recorded presentation

Abstract: A conceptual cost estimate is required during feasibility study to determine capital expenditure (CAPEX) for prospective development and usually serve as a ceiling cost estimate or early stage approved budget for any development. CAPEX can be flexible depending on the development objective. The challenge to deliver an accurate conceptual cost estimate are time constraints, limited information and wide range of uncertainties. Therefore, it is critical to build an interactive conceptual cost estimate model to support timely cost estimate as well as dependable cost estimate. This paper will outline the framework to build an interactive conceptual cost estimate model, recommended inputs for the model, setting technical/design parameters, communicate conceptual cost estimate to various stake holders and how to mitigate the risk of cost overrun.

(EST-3633) Estimating for Cost Control - Navigating the Sea of Change

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

Level: Intermediate

TCM Section(s):

7.3. Cost Estimating and Budgeting

10.3. Change Management

Type: Live webinar

Abstract: All projects experience change throughout their lifecycle in some form or another. This paper will examine: the factors associated with project changes which can affect both the accuracy and precision of the associated costs of the change, and the estimated forecasts for total project costs at completion, the best practices for change management to achieve successful cost control, and the cost estimator's role in the change management process.



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(Subject to change–Rev. 2021-05-12)

This paper will also provide recommendations to the estimator for how best to handle the cost estimation of changes to achieve project cost control throughout the project lifecycle using the skills and knowledge provided in AACE recommended practices.

(EST-3656) How to Estimate Construction Costs of a Nuclear Power Plant

Author(s)/Presenters(s): Arnaldo M. Angelini, PE; Sean T. Regan, CCP CEP EVP PSP FAACE; Apostolos (Tolis) Chatzisyneon; Dr. Geoffrey S. Rothwell

Level: Basic

TCM Section(s):

7.3. Cost Estimating and Budgeting

Type: Pre-recorded presentation

Abstract: In today's technologically advanced and competitive economy, there is a growing interest in the utilization of nuclear fission energy to guarantee a reliable power-load base and carbon free electricity but we are seeing cost competitive nuclear projects in developing countries, then traditional countries.

Every project starts with a cost estimate and for new build nuclear projects cost estimates are as essential as is a reliable process to create them. A high-quality cost estimate is decisive and critical after scope and schedule definition.

It is not easy to estimate the cost of a nuclear power plant; a large amount of time, an expert team and a reliable process are required to develop realistic cost estimates.

The purpose of this paper is to describe the development of class 3 capital cost estimates of a nuclear grade turbine building and of an administration building for a new build Pressurized Water Reactor plant (PWR NPP) under construction in the Middle East.

Quality assurance, safety and seismic regulation are essential cost drivers: their different impact on cost development of the two buildings will be shown.

The variability of the two building cost estimates will be assessed through uncertainty and risks analysis.



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

(EST-3698) Construction Cranes Parametric Cost Estimating

Author(s)/Presenters(s): Glauco Bezerra da Silva; Jose Renato Goes de Paiva

Level: Intermediate

TCM Section(s):

7.3. Cost Estimating and Budgeting

7.5. Value Analysis and Engineering

Type: Pre-recorded presentation

Abstract: Nowadays, there are several methodologies to estimate construction equipment costs, largely developed by manufacturers. These provided an adequate evaluation to determine economically between to rent equipment or to utilize own equipment.

This paper presents new approach of the estimating methodology to calculate owning costs and operating costs of large cranes and other load hoist equipment utilized in construction and assembly of industrial facilities projects in compliance with Brazilian legislation.

This methodology has been based in international parameters to calculate operational costs such as maintenance costs to achieve the lowest possible cost per hour to ensure the top machine performance and efficiency. Through researched information, and the parameters set, it was observed the relevance of the results associated with the mechanical availability and operational efficiency of each type of cranes.

In despite to owning costs of cranes, the crane depreciation method utilized, is based on various factors: the long lifetime, the market conditions, brand reputation and general conditions of intended use.

So, these final results were gone compared with those available in the rental market, excepting mark-up.

(EST-3700) Discrete Event Simulation as a Tool for Cost Estimating

Author(s)/Presenters(s): Thomas C. Cook; Gabriel Sandler; Zachary Matheson

Level: Basic



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(Subject to change–Rev. 2021-05-12)

TCM Section(s):

7.3. Cost Estimating and Budgeting

7.4. Resource Planning

Type: Pre-recorded presentation

Abstract: The Office of Program Analysis and Evaluation (PA&E) within the National Nuclear Security Administration's (NNSA) is charged with leading programmatic cost estimating and associated analytical support throughout the federal budgeting process. As part of its mission, NNSA recently authorized the reestablishment to manufacture plutonium pits for nuclear weapons. This manufacturing process involves a significant number of process steps, each requiring unique equipment and specialized gloveboxes.

While NNSA scientists have worked to modernize this manufacturing processes since the previous facility closure in 1989, no full-scale facility currently exists. To aid in project development and budget planning, PA&E has developed a discrete event simulation model of the anticipated production process to estimate equipment types and quantities for a stipulated confidence level. This analysis has been used to estimate the necessary facility size, associated equipment needs, and manpower requirements for the production of different pit designs to aid in effective budgeting, and to meet the annual production rate requirements set by Congress.

(EST-3713) Escalation Study for DOE NNSA's Capital Acquisition Projects

Author(s)/Presenters(s): Dr. Charles R. Loelius; Cash Fitzpatrick; Robert Strand; David E. Zimmerman, CCP; Presenter: Dr. Qin Pan; Presenter: Dr. Gabriel Sandler

Level: Basic

TCM Section(s):

7.3. Cost Estimating and Budgeting

Type: Live webinar

Abstract: The Office of Programming, Analysis, and Evaluation (PA&E) (NA-MB-90) within the U.S. Department of Energy's (DOE's) National Nuclear Security Administration's (NNSA) is charged with leading programmatic cost estimating and associated analytical support throughout the federal budgeting process. Within PA&E, the Office of Analysis and Evaluation (NA-MB-92) is responsible for NNSA's programmatic cost estimating, including capital acquisition estimates, analyses of alternatives ,



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(Subject to change—Rev. 2021-05-12)

and other planning estimates for NNSA strategic documents such as the Stockpile Stewardship and Management Plan (SSMP). As part of this effort, the office performed this escalation study to improve its cost estimating by investigating and selecting the most representative existing escalation index for NNSA's capital acquisition portfolio.

The study team identified NNSA's representative market basket of goods for capital acquisition projects using historical project cost data; identified published federal, commercial, and public escalation rates and factors to screen against; applied screening factors to remove inappropriate or unrepresentative indices; and selected an index based on a similar market basket of goods and other appropriate factors.

Upon completion, PA&E selected the Engineering News-Record (ENR) Construction Cost Index (CCI) as the most appropriate index for normalizing historic NNSA construction cost data and applying escalation to early-phase capital acquisition cost estimates, using the compound annual growth rate (CAGR) of the ENR CCI over the past four decades (three percent annually).

(EST-3731) Benchmarking Tool for Planning and Assessing Construction Estimates

Author(s)/Presenters(s): Zachary Matheson; Robert Strand; Christopher J. Massey; Dr. Charles R. Loelius; Cash Fitzpatrick; Jeffrey E. Beck; Qin Pan

Level: Basic

TCM Section(s):

10.4. Project Historical Database Management

7.3. Cost Estimating and Budgeting

Type: Live webinar

Abstract: The Office of Programming, Analysis, and Evaluation (PA&E), NA-MB-90 within the National Nuclear Security Administration (NNSA) is charged with leading programmatic cost estimating and associated analytical support throughout the Federal budgeting process. As part of this effort, the office has developed a benchmarking tool that incorporates both similar historic projects and modeled parametric results. This tool enables analysts to rapidly assess the reasonableness of newly proposed estimates based on simple high-level factors such as facility size, facility hazard category, and equipment complexity.



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(Subject to change–Rev. 2021-05-12)

The development team created the tool by normalizing cost and schedule data from completed and near-completed projects. The benchmarking tool outputs graphics comparing the proposed estimates with a similar set of analogous facilities. The graphs also compare the estimates with prediction intervals developed from a set of NNSA parametric cost and schedule estimating relationships, previously presented at the 2019 AACE International Conference & Expo. Applications include the generation of standard, data-informed visualizations to help decision makers understand estimates in a broader historical context and to also aid analysts in tracking estimate variability over time.

(EST-3741) EPC Nuclear Power Project Cost Database Establishment and Cost Prediction Method Study

Author(s)/Presenters(s): Siqi Liu

Level: Basic

TCM Section(s):

6.3. Asset Historical Database Management

11.3. Information Management

Type: Pre-recorded presentation

Abstract: Due to the complexity and the large number of participants in nuclear power projects, the cost related data is rich and fragmented. This article analyzes the needs of building a nuclear power project cost database through the E-R model diagram tool and designs the table structure and relational cost database via Microsoft Access software platform. Besides, this article uses Bayesian network to develop a project cost model, incorporates the main factors affecting cost and sorts out the conditional probability relationship among those cost factors through historical data accumulated in the cost database. Finally, the purpose of cost estimation can be achieved through Bayesian network model.

(EVM-3614) Earned Value Management Systems for Operations Activities

Author(s)/Presenters(s): Dan Melamed, CCP EVP FAACE; Crystal Williams; Lisa Ramdas; Rodney Lehman

Level: Basic

TCM Section(s):



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

9.2. Progress and Performance Measurement

6.3. Asset Historical Database Management

Type: Live webinar

Abstract: An earned value management system (EVMS), which monitors contractor performance, is a requirement for program and project management for all major acquisitions by the United States Federal Government with development effort: (i.e., an asset requiring management attention because of its importance to an agency's mission; high development, operating, or maintenance costs; high risk and/or high return).

As an area less explored in earned value management (EVM) practices, this paper will survey the application of an EVMS for operations activities defined as:

- Non-capital asset activities that are projects (or project - like) with definable start and end dates, with discrete scopes of work, and measurable accomplishments; as well as
- Routine or recurring facility or environmental operations.

This paper will examine the use of an EVMS to evaluate performance of operations and maintenance activities required once construction of a capital asset is complete and being used as intended. Such activities include upgrades and maintenance in order for capital assets to meet their mission function over a life-cycle (through repair, replacement, etc.).

This paper will provide background on this topic from the perspective of the Department of Energy (DOE) Environmental Management (EM) Program. In addition, it will provide material from a panel discussion provided by a group of experts from the October 2019 Office of Environmental Management Project Management Workshop, as well as material from subsequent research on this topic.

(EVM-3664) Evolving Technological Trends for Automated Construction Progress Monitoring

Author(s)/Presenters(s): Dr. Bahadir V. Barbarosoglu, CCP EVP PSP

Level: Advanced

TCM Section(s):

10.1. Project Performance Assessment

9.2. Progress and Performance Measurement



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

Type: Pre-recorded presentation

Abstract: Construction progress data are traditionally captured by individuals through manual efforts such as taking notes on a schedule print-out during site-walks. The quality and accuracy of the progress data collected manually depends on individuals' observation skills, experiences and semiquantitative interpretations. In the absence of supportive visual data such as photos and video footages, the manually collected data cannot be peer reviewed or audited by others, thus remains as the single source of truth. In addition to being open to human errors and subjective interpretations, the traditional process of capturing construction progress data and updating project status can be complex, time-consuming, and misleading towards incorrect conclusions, regardless project size, type and delivery method. Even though commercially available hardware and software technologies offer automation and standardization in construction progress monitoring, they possess limitations and are not widely adopted. This paper aims to review both academic research and applications in the industry for new technological developments and recent evolution of existing technologies that relate to automated construction progress monitoring. The paper synthesizes the parallelism between academia and the industry, compares differences, and finally discusses the future trends.

(IND-3776) Avoiding Cost Overruns Through Accurate Risk Forecasting

Author(s)/Presenters(s): Dan Demangos, EVP; Jarod M. Maloney

Level: Basic

TCM Section(s):

7.6. Risk Management

11.3. Information Management

Type: Live webinar

Abstract: Risks come in all shapes and forms, but eventually there is a cost associated with all of them. Identifying these risks is important but if you want to minimize them from jeopardizing project profitability, understanding their cost impact is just as important. Join Dan and Jarod as they illustrates how use Deltek products to deliver accurate cost forecasting.

(IND-3777) TBD



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(Subject to change–Rev. 2021-05-12)

Author(s)/Presenters(s):

Level:
TCM Section(s):
Type: Live webinar

Abstract:

(IND-3778) TBD

Author(s)/Presenters(s):

Level:
TCM Section(s):
Type: Live webinar

Abstract:

(INT-3655) How Expert Opinions Help Restoring Project Management Systems on Public Infrastructure Projects

Author(s)/Presenters(s): Tsang Wong, PE; Steven A. Huyghe

Level: Basic
TCM Section(s):
6.4. Forensic Performance Assessment
Type: Pre-recorded presentation

Abstract: A mass transit railway project in Hong Kong ran into a scandal being accused by a whistleblower that the underground structure was unsafe due to defective work. The underground structure comprises diaphragm walls constructed along the track alignment, and 10-ft thick concrete slabs constructed on top of the diaphragm walls as props and to form the railway tracks. Extensive rebar couplers were designed to connect the diaphragm walls and slabs. The whistleblower attested that the coupler connections were not properly installed, and some connections were even not



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(Subject to change–Rev. 2021-05-12)

connected. It was a serious accusation and led to substantial public safety concerns. The Hong Kong government, being the project owner, commissioned a public inquiry chaired by a retired judge to investigate the accusation, evaluate the structural safety and project management process, and come up recommendations. The authors of this article were engaged to give expert evidence in relating to project and construction issues and offer recommendations to prevent further occurrence of similar incident. This paper will discuss topics being evaluated including design management, submission approval process, field design change process, record keeping, NCR procedures and quality supervisions as well as expert's role in public inquiry which is a formal fact-finding legal proceeding under common law.

(OWN-3592) Capital Budgeting Criteria and Project Selection by Net Present Value (NPV) vs. Internal Rate of Return (IRR)

Author(s)/Presenters(s): Chad Itagi, P.Eng. CCP CEP PSP; Nanda Itagi, CCP

Level: Advanced

TCM Section(s):

3.2. Asset Planning

3.3. Investment Decision Making

Type: Pre-recorded presentation

Abstract: The COVID-19 impact on the oil and gas industry is so huge, on Monday April 20th 2020, the price of one American oil futures contract plunged into the negative for the first time in history. Sellers of West Texas Intermediate (WTI) scrambled to dump May contracts and Oil futures prices nosedived and plunged below zero. The oil and gas industry experiencing its third price collapse in 12 years. After the first two shocks, the industry rebounded, and business as usual continued. This time is different! Which resulted in \$ 130-to-\$140 billion dollar Capital spending cut across Upstream projects in year 2021 to 23.

Hence, the Oil and Gas operating companies and owners foresee a continued reduction in Capital Investment, which is the major impact to upstream especially for onshore projects. So, the execution of Capital Project including funding criteria and mechanism needs to be re-assessed. It is no-more business as-usual for funding. Hence, the Oil and Gas Operating companies forces to utilize the "Master Appropriation" funding mechanism.



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(Subject to change–Rev. 2021-05-12)

The paper will explain the lifecycle of "Master Appropriation" projects including in implementation of funding mechanism with Pro's-Con's of Capital Master Appropriation projects. The paper illustrates aspects of master appropriation in funding to financial close-out with an examples to utilize across Oil and Gas industry.

(OWN-3626) (Presentation Only) Improving Predictable Outcomes on Offshore Oil and Gas Projects

Author(s)/Presenters(s): Aileen A. Jamieson

Level: Basic

TCM Section(s):

3.3. Investment Decision Making

6.1. Asset Performance Assessment

Type: Pre-recorded presentation

Abstract: In the year before COVID, the oil and gas industry announced a considerable number of projects with early start-up of production as well as completing under budget. This was a phenomenon that was unheard of only a few years previously. However, examining some of these "exceptional projects" in greater detail highlighted that many of them had, in fact, built something with a different or reduced design from the approved scope. In other cases, the planned schedule was significantly longer than should have been necessary, and their "early start-up" was no quicker than anyone else building the same type of facility.

There is no doubt that the industry has learned some important lessons since the oil price crash end 2014, but can we now believe that these results are the new normal? What changes will we expect to see post-COVID? How can we predict if a project will actually complete on time and budget?

This presentation will use field data from a joint industry project which has been benchmarking completed offshore projects for over twenty five years. The analysis will examine the changes in cost, schedule and scope from investment approval to project start-up for recently completed projects to identify ways to improve predictability on your final cost and schedule.

(OWN-3660) How the Owner Contracting Strategy Affects Project Control



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(Subject to change–Rev. 2021-05-12)

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

Level: Advanced

TCM Section(s):

2.4. Project Control Process Map

8.1. Project Control Plan Implementation

Type: Live webinar

Abstract: Looking to the future of the owner/contractor relationship environment, it has never been more important to consider how this relationship should be structured to deliver the project safely, at the quality defined, on time and within budget. These owner expectations seem simple but the historical record over the past 10+ years, especially on major projects, reads quite differently. Project expectations are not being achieved, and the rationale behind this spans owner, supplier and contractor issues.

Owners have difficulty locking down business case criteria, which in turn changes the capacity, timing and other parameters for the project. The farther along in the project development process this occurs, the more impactful it becomes to the venture. Suppliers are also responsible for some of these project issues with missed delivery dates and quality issues. The engineering/construction contracting community also has some culpability here. Contractors are understaffed and overly aggressive in bidding projects, allowing for unachievable goals from contract award through project completion. The way all entities function cohesively is vitally important to overall project success.

The owner's contracting strategy, which is intended to weave a path through all of the potholes outlined above, also has a huge impact on the project control environment required for project delivery. The level of transparency across resource hours and cost/schedule data is crucial to keeping a project on track. A critical standard used to select one project control approach over another is the level of transparency desired by the owner. This is often overlooked when considering all the other measures for selecting the optimum contracting approach.

This paper will outline the interface aspects of project controls and varying types of contract strategies. Several examples will be given and the top 10 criteria for contract strategy selection will be shared. Several publicly available tools will be demonstrated that can assist owner organizations through this complex project planning step.



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(Subject to change–Rev. 2021-05-12)

(OWN-3666) Improving Project Gatekeeping Through Stakeholder Alignment and Behavioral Decision Making

Author(s)/Presenters(s): David C. Wolfson

Level: Advanced

TCM Section(s):

2.3. Strategic Asset Management Process Map

Type: Live webinar

Abstract: When looking at why many major projects fail to meet their cost and schedule expectations, the root cause is often a misalignment between the engineered solution and the owner's business case. This paper will explore this issue by first briefly describing the gatekeeping process. At its core, gatekeeping is a decision-making process and so next, the paper looks at decision making in the context of projects. Stakeholder management, salience and interaction with gatekeepers are explored next. The interrelationships between gatekeeping, decision making, and stakeholder management is illustrated by looking at both a simple and a slightly more complex project. Even in these simple examples it is apparent how misalignment can occur. From an owner's perspective, misalignment at the project approval stage can have very significant financial repercussions. This paper offers three strategies to mitigate potential misalignment, based on our examination of decision making and stakeholder management.

(OWN-3727) Executability Modeling to Support Improved Federal Budgeting

Author(s)/Presenters(s): David Livchack; Robert Case; Jeffrey E. Beck; Christine Suhr

Level: Intermediate

TCM Section(s):

9.2. Progress and Performance Measurement

Type: Pre-recorded presentation

Abstract: The Office of Program Analysis and Evaluation (PA&E) within the National Nuclear Security Administration's (NNSA) is charged with leading programmatic cost estimating and associated analytical support throughout the federal budgeting process. Part of its support to NNSA leadership includes an



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(Subject to change–Rev. 2021-05-12)

assessment of individual program requests when resources are constrained, ensuring resources are allocated appropriately and that programs are ultimately neither overfunded nor underfunded.

To provide a more data-driven assessment, PA&E created an Executability Model. It analyzed prior NNSA budgets against actual execution profiles, identified and grouped programs which follow similar executability profiles, and defined health metrics when assessing proposed budget scenarios. The Executability Model will help inform overall NNSA budgeting decisions, enable the rapid analysis of various budget scenarios, and promote effective portfolio management.

(PM-3638) Megaproject Success Factors

Author(s)/Presenters(s): Noorussaadah Bt Yahya, Sr.

Level: Basic

TCM Section(s):

7.1. Project Scope and Execution Strategy Development

7.5. Value Analysis and Engineering

Type: Pre-recorded presentation

Abstract: Industry benchmarking shows that a company's megaproject performance is very close to the industry average and almost in the top quintile as compared to other typical megaproject performance. The megaproject is deemed to be one of only a handful of successful megaprojects that has met four industry criteria for megaproject success of cost underrun, average cost-effectiveness, limited execution schedule slip, and average schedule effectiveness. This paper will showcase the key success factors along with the best practices adopted in successfully undertaking efforts to drive a megaproject towards being delivered at a manageable and competitive cost. It is suggested that the project competitiveness is driven largely by effective project shaping and definition, developing a strong project management team, and maintaining good discipline during execution as well as safety and HSE requirements, all of which are critical as the building blocks for a successful megaproject. A study on a company's mega project has been conducted and aims to shed light on factors that have contributed to the success of the megaproject execution and delivery. The goal is to identify primary lessons learned and key take aways from the overall study that potentially can be put into practice and become a part of the system to improve future project execution and performance.



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

(PM-3644) Project Management of Refinery Turnaround with Real-Time Indicator

Author(s)/Presenters(s): Mahesh Jadhav; V. Varun Prabu

Level: Intermediate

TCM Section(s):

7.2. Schedule Planning and Development

7.6. Risk Management

Type: Pre-recorded presentation

Abstract: Project management of a refinery turnaround with real-time indicators is a process of management used for refinery shutdowns and turnarounds to manage risks and unexpected situations that threaten the budget, schedule, and safety. In rolling wave planning, the risk assumption and milestone originally identified become more defined and reliable over time, whereas shutdown planning involves a detailed progressive study of known knowns, known unknowns, and unknown unknowns risks within the schedule. Advanced planning and scheduling of a turnaround project with real-time indicators optimizes scheduled maintenance; and ensures scenario and data-driven decision making. It also crashes the critical path and any demand to reduce inventories. We can analyze contingency percentages within the schedule border, increase the work output efficiency with minimum downtime, and maximize production on bottleneck resources to increase revenue. The process implementation of this process helped to achieve a schedule start to early finish of the refinery turnaround by 45Hrs, which saved 14,000 man-hours (403,200 man-hours actual TA planned) and showed 3.5% additional profit improvement in resource cost.

(PM-3673) Modular Commercial Construction

Author(s)/Presenters(s): Edward E. (Ted) Douglas, III CCP PSP FAACE Hon. Life

Level: Basic

TCM Section(s):

11.5. Value Management and Value Improving Practices (VIPs)

7.1. Project Scope and Execution Strategy Development

Type: Pre-recorded presentation



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

Abstract: There has been a significant increase in the use of modular construction methods over the past several years. Modular construction has been described by the Engineering News Record (ENR) as “Creating buildings in modules at an offsite plant and then shipping the (one or more) prefabricated sections to the jobsite.” Commercial modular successes range from relocatable classrooms to permanent dormitories; three to five story hospitality and health care facilities; multifamily (affordable) residential housing; as well as the 32-story, 363-unit Forest City Tower completed in Brooklyn, New York and the more recent 58-story mixed use Rainer Square Tower in Seattle, Washington.

The Modular Building Institute (MBI) suggests that the advantages of modular project delivery method include reduced jobsite disturbance, improved worker safety and more predictable schedule and cost certainty. Additionally, the offsite manufacturing process provides opportunities for better quality management, with less material waste and reduces jobsite congestion.

This paper describes the phases of modular construction and the requirements for successful implementation of the modular project delivery method. Included is a discussion of the project controls (PC) and project production management (PPM) collaboration requirements to support commercial modular construction. This paper is based on virtual conferences, webinars, interviews and literature research of over 60 articles and publications.

(PM-3705) Field-Level Enhancement Practices For Change Orders

Author(s)/Presenters(s): Neil D. Opfer, CCP CEP PSP FAACE

Level: Intermediate

TCM Section(s):

10.3. Change Management

Type: Pre-recorded presentation

Abstract: Changes from as-bid work scope are common in construction and therefore construction contracts typically have provisions for handling change orders. There is a significant amount of published information concerning change orders but this information fails to focus on field-level enhancements in this area. Both from experience and discussions with other industry professionals has found that failures in handling change orders at the field level are a key reason for profit fade.

Therefore field personnel need enhanced procedures for recognizing changes and then dealing with these changes. There are times when design-drawing changes seem to be purposely not called out but



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(Subject to change–Rev. 2021-05-12)

these same changes will significantly increase line-item work scope. Field personnel can take advantage of technology such as electronic document analysis to spot changes that otherwise would have been missed in plans. An approach to improvement should also look at pricing of change orders on a lump-sum basis unless unit-pricing is in place. Daily time cards and time-card automation can both help to capture all labor costs. Field-first-line supervisors, often, are ill-suited to the paperwork involved in change order management and require training. Corrections for these above issues and others are essential and the focus of this discussion.

(PS-3597) Practical Planning and Scheduling of Capital Projects in the Pharmaceutical Industry

Author(s)/Presenters(s): Francisco Cruz Moreno, PE

Level: Intermediate

TCM Section(s):

7.2. Schedule Planning and Development

10.3. Change Management

Type: Pre-recorded presentation

Abstract: Initiating a pharmaceutical capital project requires a deep understanding of the unique processes related to current Good Manufacturing Practices (cGMP), along with experience in the design, procurement, construction, commissioning, qualification and validation of facilities, utilities and equipment. Additionally, planning should account for the regulatory affairs that will allow bringing a product to market in this highly regulated industry. While most of the pharmaceutical capital projects are schedule-driven given the business model of being first-to-market, improper planning and delays constantly jeopardize the release of new products.

This paper describes practical techniques to plan and schedule new construction and renovations of existing buildings, typical sequences and durations used for commissioning, qualification and validation activities, timing for engagement with different stakeholders, common pharmaceutical terminology employed during all phases of the project, and recommended approaches to leverage previously performed work to potentially gain time in the project schedule. The author has successfully used these practices in manufacturing facilities for oral, parenteral and topical administration products located in the Americas, Europe and Asia.



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

(PS-3608) Schedule Beta: A Financial Tool to Evaluate Project Schedule Performance by Analogy to CAPM Approach

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

Level: Advanced

TCM Section(s):

9.2. Progress and Performance Measurement

7.2. Schedule Planning and Development

Type: Pre-recorded presentation

Abstract: The earned value metric schedule performance index (SPI) has limitations in describing a project's schedule performance and variances. A new research study conducted by Construction Industry Institute (CII) has suggested augmenting SPI with a new way of evaluating and assessing performance.

Schedule beta (β) originates from stock performance index in finance and has a potential to become a new standard of measuring performance and quantifying systematic and specific risk in a project's duration-based metrics.

This technical paper will demonstrate a mathematical formulation and will exhibit the practicality of applying schedule beta to determine a project's duration-based risk or opportunity. A brief introduction, and highlights of the original theory of capital asset pricing model (CAPM) developed in the sixties by Sharp, Lintner and Black, and Fischer, Jensen and Scholes will be presented. The theory will then be customized and applied to a sample project for the purpose of investigating that project's risks and measuring its performance versus other projects in a portfolio.

(PS-3616) A Planning and Scheduling System for Successful Project Delivery: A Case Study

Author(s)/Presenters(s): Hannah E. Schumacher, PSP FAACE; Jonathan R. Hunt

Level: Basic

TCM Section(s):

7.2. Schedule Planning and Development



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9.2. Progress and Performance Measurement

Type: Live webinar

Abstract: To deliver projects on time, one must have a reliable and predictable project schedule that is developed with input of all parties, frequently updated throughout the course of the project, and is used as a tool by the project team and all stakeholders to manage the project. While it is important to have knowledge of how to use scheduling software, it is even more important to have a thorough understanding of the best practices of planning and scheduling. This paper outlines best practices to implement a successful scheduling program.

In this paper the authors will describe their company's scheduling management process for developing and managing schedules for successful project delivery. They will describe their guidelines and training programs that help project team members successfully plan, manage, and communicate their schedules.

(PS-3617) It's Just a Game: Construction Knowledge through Game-Based Learning

Author(s)/Presenters(s): Dr. Todd L. Sirotiak, CCP; Dr. Heather Eilers

Level: Basic

TCM Section(s):

11.2. People and Performance Management

7.2. Schedule Planning and Development

Type: Pre-recorded presentation

Abstract: Conveying scheduling concepts and management techniques can be challenging with an audience of varied experience, learning styles, age demographics, education and interests. Although learning new skillsets is the goal, companies often struggle with how best to perform that function. In addition, people often quickly forget new materials if not immediately utilized or easily recalled to memory. Reducing the time it takes parties to comprehend complex information also helps budgets. Improving team morale and recollection through association also creates significant value. Education research shows that interactive learning is more effective and impactful than passive learning. Since complex rules and skills can often be obtained through gaming or utilizing visual schedules, games and simulations can simplify concepts and convey significant information more efficiently. This paper will provide examples utilized in industry and academia that could be applied to other situations. This paper



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(Subject to change–Rev. 2021-05-12)

also challenges teachers and facilitators to be creative and more interactive in their delivery of information.

(PS-3642) Scheduling Metrics and the Dangers of Remaining Silent

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

Level: Basic

TCM Section(s):

10.1. Project Performance Assessment

9.2. Progress and Performance Measurement

Type: Live webinar

Abstract: Software makes it simple to identify and count particular aspects of CPM schedules in what is known as “schedule metrics”. Some companies and governmental agencies have already implemented systems to measure the schedule quality using their selected metrics, with predefined thresholds. As such, multiple guidelines have made their way into the project controls industry, but most of them have been declared by fiat, not community consensus. Soon they will be considered industry standards, even without input from the users.

But are the right aspects of schedules being evaluated or just the easy ones to measure? And what message do these metrics convey? The application of a “one size fits all” quality criteria ignores the fact thresholds are impacted by a variety of factors.

Are commercially proprietary measurements becoming required industry standards without proper consultation? The project controls community should become involved in setting the standards that they will be using.

This paper highlights the dangers of remaining silent when others are defining the schedule quality by mere convenience than community acceptance. It could serve as basis for a future RP on the subject.

(PS-3643) Scheduling for the Owner on the \$6B Dulles Corridor Metrorail Project

Author(s)/Presenters(s): Michael P. Ryan, PE PSP; Matthew Marzilli, PSP



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Level: Basic

TCM Section(s):

7.2. Schedule Planning and Development

8.1. Project Control Plan Implementation

Type: Pre-recorded presentation

Abstract: The goal of every project is to complete the work on-time and on-budget. While often undervalued, the owner has an essential role in the development and maintenance of the project's critical path method (CPM) schedule. Written by the schedulers for the Metropolitan Washington Airports Authority on Phase 2 of the \$6B Dulles Corridor Metrorail Project, this paper shares the lessons learned during this fast-paced, exciting project.

Questions answered include: What are the best ways to explain the critical and near-critical paths of a complex schedule to non-schedulers? How can one effectively distill a 40,000-activity schedule into layouts that the owner's on-site management team can actually use? What non-CPM schedule tools can be used to better illustrate the plan and track progress?

A successful scheduler must fully understand the contract and be able to coordinate with team members from different disciplines, regardless of the project's size. This project provides an excellent case study on real-time scheduling and project management on a US-based megaproject. The lessons learned can be applied to other large-scale transit projects across the world.

(PS-3648) Getting Back to Basics: Update Schedule Review by the Numbers (Recommended Practice Numbers, that is)

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

Level: Basic

TCM Section(s):

9.2. Progress and Performance Measurement

7.2. Schedule Planning and Development

Type: Live webinar



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Abstract: Performing an update schedule review submitted by a 3rd party requires a vastly different skill sets than that of creating a schedule. The scheduler who creates a schedule works with a large number of construction professionals who will provide feedback and guidance. Typically, the scheduler who reviews a 3rd party's schedule submittal works alone. This process can be quite daunting for the first-time reviewer.

The reviewer does not need to work alone as long as there is an access to AACE's incredible library of recommended practices and technical papers. This paper focuses on the key documents that aid in determining the main topics of the review memorandum, assist in identifying the culprits that make schedule updates non-compliant, as well as provide solid guidelines on how to gauge schedule's overall quality. The authors hope to inspire and motivate project controls professionals to advance their skill set from being a proficient scheduler to becoming a trusted scheduling consultant.

(PS-3715) Paper or Plastic? Microsoft Project versus Oracle Primavera P6

Author(s)/Presenters(s): Charlie Jackson, PSP; Hannah E. Schumacher, PSP FAACE

Level: Basic

TCM Section(s):

7.2. Schedule Planning and Development

11.3. Information Management

Type: Live webinar

Abstract: Selecting the appropriate scheduling software to be used for a project is one of the key decisions that must be made prior to the start of the project. The choice of scheduling software is often dictated by contract documents or by the contractor's company standards and guidelines. Regardless of the selection process, the scheduler is going to be 'stuck' with this decision for a long time and he/she needs to realize how this decision affects the development and management of the project schedule.

It is important to understand the features, benefits, and limitations of using the selected scheduling software. In this paper, the authors examine two of the leading scheduling software tools that they regularly use on real construction projects: Microsoft Project Standard and Oracle Primavera P6 Professional. The authors explain the details on how these software packages may best be utilized for scheduling construction projects and programs.



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(Subject to change–Rev. 2021-05-12)

(PS-3722) The Art of Scheduling

Author(s)/Presenters(s): Sylvia M. Donado

Level: Basic

TCM Section(s):

7.2. Schedule Planning and Development

7.4. Resource Planning

Type: Pre-recorded presentation

Abstract: With every discipline, foundational concepts are instilled and continually used and developed in order to reach advanced levels. These relate to a core set of technical principles and aspects of a particular craft. In mastering the technical aspects and continually refining those skills, an individual can learn to use those rules in their own way in order to give the work stronger meaning and effectiveness. This same thought process applies to the arts as well as the sciences.

In today's complex climate, everything has become segmented where technical and creative skills are seen as separate skillsets yet they both have significant value in managing projects. The manner in which technical skills get applied is what leads to effectively developed schedules and management of CPM schedules in order to effectively manage and control projects. Proper CPM techniques have proven to be extremely effective in establishing a communication of a plan, establishing production goals, monitoring and managing progress, and managing change in projects and programs.

(PS-3742) Schedule Effectiveness versus Specification Compliance, Which Should Prevail?

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

Level: Basic

TCM Section(s):

7.2. Schedule Planning and Development

10.1. Project Performance Assessment

Type: Live webinar



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(Subject to change–Rev. 2021-05-12)

Abstract: When projects are affected by unexpected or as-built events such as unforeseen conditions, design errors and/or omissions, or owner 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-3748) Understanding What Makes a Truly Good Schedule

Author(s)/Presenters(s): Richard Robson; Satinder S. Baweja, CCP

Level: Intermediate

TCM Section(s):

7.2. Schedule Planning and Development

9.2. Progress and Performance Measurement

Type: Pre-recorded presentation

Abstract: Opinions about whether a project schedule fits its purpose are as many and varied as planners themselves. Even the need for one is frequently seen as merely obligatory. Project leaders assume they and their team already know how to deliver a project. Worse yet, when not formally required, any handy piece of scrap paper might serve as one. No wonder project planning is treated as an unprofessional discipline, a pseudo-science like reading palms, leaving no desire to ensure that the schedule serves its higher calling.

Such carelessness may be heavily punished in the inevitable commercial disputes that follow time and cost overruns. Assuming that, as the Benjamin Franklin axiom states, an ounce of prevention is worth a pound of cure, a schedule should be continuously checked against three holistic criteria:

- Content



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(Subject to change—Rev. 2021-05-12)

- Technique
- Clarity

These three factors and their positive effect upon project outcomes will be presented in detail. They are the means to creating a valuable project delivery tool. A holistic approach based on them is a promising start to building and maintaining an excellent schedule that affects a positive change in project delivery.

(PS-3769) Implementing the Half-Step Analysis During Your Project - The "Devil" is in the Details (Half-Step Analysis Phase III)

Author(s)/Presenters(s): Matthew G. Nichols, PSP; Brian J. Furniss, PE CFCC PSP

Level: Intermediate

TCM Section(s):

7.2. Schedule Planning and Development

10.2. Forecasting

Type: Live webinar

Abstract: The half-step analysis method segregates and quantifies schedule progress and revisions on an update-by-update basis. The power of the method lies in the ability to assess the performance of a plan (progress) and how that plan changed (revisions) over project time, providing a unique understanding of a project's evolution. For example, a project milestone could be losing progress on a monthly basis, yet the project milestone could appear to be making as-expected progress if the contractor minimized the progress loss by revising the remaining schedule activities.

Two prior Technical Papers, CDR.2305 and PS.2491, provided macro-level examples of how this method could be used to better understand a project both during and after its completion. This paper will explain how to perform a half-step analysis using Primavera P6 in a step-by-step fashion and using clear graphics. The process to complete the half-step analysis is simple; however, there are options and steps that must be followed to ensure an accurate bifurcation result. As with most successful analyses, the "devil" is in the details.

After demonstrating how to progress a schedule, the paper will also demonstrate how to analyze schedule revisions, and more importantly, critical schedule revisions. Finally, the paper will cover real-



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(Subject to change–Rev. 2021-05-12)

life applications of the half-step analysis on multiple projects, both for a monthly schedule review and a forensic schedule analysis.

(RISK-3602) (Presentation Only) Managing Risk and Uncertainty for Large and Small Projects

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

Level: Basic

TCM Section(s):

7.6. Risk Management

Type: Pre-recorded presentation

Abstract: The goal of a project development and execution process is to select the right project and execute that decision with excellence. This practical presentation addresses how decision & risk analysis is used in the industry to make informed decision by comparing alternatives, quantifying risks & uncertainties and evaluating financial outcomes. Tools such as decision hierarchy, strategy table, influence diagram, tornado chart, decision tree and S-curve will be presented and how they are used to make complex decision on actual large as well as small projects.

(RISK-3649) Comparative Risk Analysis Method

Author(s)/Presenters(s): Alexandre Rabello David, Sr.

Level: Advanced

TCM Section(s):

7.6. Risk Management

Type: Pre-recorded presentation

Abstract: This is a methodology designed to determine CAPEX differences for the implementation of the same project, through the comparison of risk perception from different perspectives.

The methodology, called comparative risk analysis method, consists of determining different confidence intervals to be applied to CAPEX necessary for project implementation, considering a given scope and



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(Subject to change–Rev. 2021-05-12)

varied modeling on how to implement. Alternative forms of contracting and contractual obligations are explored as models.

For the performance of the simulations, weights are assigned to different levels of impacts and the Monte Carlo method is applied.

As a result, a confidence interval is generated for each modeling considered in the simulation, so that there will be a specific CAPEX for each modeling and its percentile of the distribution curve.

The comparative risk analysis method can be considered as another alternative to be joined to existing methodologies for determining confidence intervals and contingencies.

(RISK-3658) Uncertainty Management Includes Risk Management

Author(s)/Presenters(s): A. Hilje Langeland

Level: Basic

TCM Section(s):

7.6. Risk Management

Type: Pre-recorded presentation

Abstract: This paper describes the Norwegian best practice method of uncertainty management, including how it works and some of its results. Uncertainty analyses of investment costs are a key component of the decision-making basis (decision & risk management (DRM)) in project management and portfolio management and a central component of quality reviews conducted before decisions are reached in major government projects. Uncertainty analyses are used in an interdisciplinary advisory capacity and for quality review purposes. They are used by Norwegian companies, project portfolios, the real estate industry, and government ministries.

While average overruns of investment cost (CAPEX) reported in international studies typically have been over 30 per cent [1], or between 12 and 24 per cent [2], Norwegian studies report average overruns of two per cent [3]. The motivation behind this paper is the observation that projects practicing uncertainty management appear to reduce project cost overrun and increase project success rates. The method practiced in Norway has some methodological differences from the one presented by John K. Hollmann [4] and in traditional risk management methods. Risk management is an integral part of uncertainty management.



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(Subject to change–Rev. 2021-05-12)

Over the last 20 years it has been different challenges related to combine risk management and uncertainty management. These changing, complex and uncertain times require better, integrated leadership, and the value of handling risk and uncertainty has increased. The author therefore wishes to share this best practice knowledge with AACE members. The COVID-19 pandemic has also granted the uncertainty management process, with its high-quality digital facilitations, and the opportunity to improve the analytical process independent of geographical area.

(RISK-3689) Integrated Cost-Schedule Risk Analysis: Application of Project Risk Twin Process for Major Infrastructure Projects using RIAAT (Digital Twin)

Author(s)/Presenters(s): Dr. Philip Sander; John J. Reilly, PE; Dr. Michael Essig

Level: Intermediate

TCM Section(s):

7.6. Risk Management

Type: Pre-recorded presentation

Abstract: Digital twin (DT) – a representation of an object or process from the real into the digital world. Key aspects are the transfer of data and the ability to run simulations as to predict possible future outcomes. This term is also used to describe digital models of large infrastructure projects as in recent years there have been significant technological advances in the areas of modeling and simulation. The same applies to the great progress that has been made in the integrated modeling of project cost, schedule and the risks associated with these projects.

This paper discusses the project risk twin (PRT) process, which considers the correct application of integrated cost and schedule risk analysis with additional advanced features such as risk correlations, dependencies and linkage, event tree analysis, Poisson distributions for multiple risk occurrences, calculation of potential future delay cost (i.e., liquidated damages and penalty cost), and escalation. The PRT process accompanies the project throughout the planning, construction and operation phase. Key benefits are understanding, analyzing and proactively mitigating risks, avoiding construction delays and developing and seizing opportunities. This is achieved through the application of advanced modeling techniques and simulation to predict future outcomes.



The following combination of live webinars and pre-recorded technical sessions are scheduled to be offered for the 2021 Virtual Conference & Expo

(Subject to change–Rev. 2021-05-12)

Demonstration of an application of the PRT and the abovementioned features are presented in the case study. The model is built up and visualized using RIAAT (risk administration and analysis tool) software.

The PRT process discussed in this paper is consistent with the AACE Recommended Practice “57R-09: Integrated Cost and Schedule Risk Analysis Using Risk Drivers and Monte Carlo Simulation of a CPM Model”. The paper also highlights additional features of the PRT process not covered by RP 57R-09.

(RISK-3699) The Value of Prioritization Criteria to Federal Agencies

Author(s)/Presenters(s): Abiodun Ajayi; Samantha O'Donnell; Jonathan Maschio; Auguste Boova; Jodie Kim, PE; Michael Donoghue

Level: Intermediate

TCM Section(s):

3.3. Investment Decision Making

2.3. Strategic Asset Management Process Map

Type: Pre-recorded presentation

Abstract: Organizations often struggle to determine their project portfolio requirements, select the right projects to execute, and provide justification for the formation of the capital budget. To combat this, they should develop a portfolio prioritization approach that focuses on ways to quantifiably rank projects against each other while considering risks and priorities of the organization.

A portfolio prioritization approach should include detailed budget information that can be drilled down by program, project type, and appropriation type to enhance transparency in funding allocations, enable rapid development of reports to answer budget questions efficiently and correctly, and inform management for data-driven decision-making. This approach would include existing project information and the application of a scoring methodology to weigh the risks and priorities of a project and determine its eligibility for funding. The output can allow agencies to compare funded and unfunded requirements, make informed decisions on projects to execute, and determine how to allocate or reallocate budget for capital planning.

Such a portfolio prioritization approach has been used at several federal agencies. This paper explores how risk and priority assessment criteria allow for an effective prioritization of projects with quantifiable



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(Subject to change—Rev. 2021-05-12)

outcomes and an optimized capital spend plan. Further, this studies the applicability and scalability of these prioritization criteria at other agencies using a predictive analysis.

(RISK-3703) Construction Value Chain Investments to Achieve Social Return on Investment

Author(s)/Presenters(s): Shanna Hawley; Corey Edson; Auguste Boova; Eric Dembert; Rahul Gupta; Tim Kelly; Jodie Kim, PE

Level: Intermediate

TCM Section(s):

3.2. Asset Planning

3.3. Investment Decision Making

Type: Live webinar

Abstract: The construction industry is a historically competitive market driven by multiple players, including building owners, designers, and builders motivated primarily by financial return. Representing more than 8 percent of the global GDP, the construction industry has continued to grow as skyscrapers and large complexes emerge in even more suburban and rural areas. The industry, however, has not been immune to the COVID-19 pandemic, as the white-collar workforce has shifted to a remote working environment while also giving up their high-rise apartments for more affordable homes in less populated areas. As a result, many workspaces are left unused as occupancy rates plummet.

To combat the decrease in demand for the physical workspace, construction and real estate players may need to adjust their business models to incentivize consumers to reoccupy spaces. The realigned focus on improving and protecting the well-being of occupants requires a shift by all members of the construction value chain to focus on social returns on investments (SROI). This paper will evaluate perspectives on the benefits of achieving SROI and the types of investments that each key player of the construction industry—owners, designers, and builders—needs to make to disrupt the value chain.

(RISK-3751) The Case for Parametric Quantification of Systemic Risks for Transportation Projects

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



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(Subject to change—Rev. 2021-05-12)

Level: Intermediate

TCM Section(s):

7.3. Cost Estimating and Budgeting

7.6. Risk Management

Type: Live webinar

Abstract: AACE® International recommended practices (RPs) address empirically-based, risk-driven parametric modeling to quantify systemic risks. These RPs reflect the process industry’s embrace of phase-gate project systems and extensive research supporting the methods. While the cost overrun-prone transportation sector is catching up in applying phase-gate systems, it lags in benchmarking and research and has been detoured away from the RP methods. Research showing that fundamental practice failures (i.e., systemic risks) cause cost growth has been largely ignored. Instead, an unsupported hypothesis as to the cause of cost overruns called the planning fallacy (i.e., optimism bias or lying), and a pessimistic “de-biasing” practice called reference class forecasting (RCF) are being embraced by some in transportation. The danger is that RCF will institutionalize mediocrity of cost outcomes; a detour to an economic dead end.

A principle called the fifth hand, reflecting situational-specific, mixed causes of cost overrun, that aligns with research and AACE RPs, is reviewed. However, what is missing from the debate is the fact that too-narrow estimate accuracy range expectations are wired into owner phase-gate procedures. Estimators use subjective risk analysis that underestimates contingency because it meets these expectations; i.e., the planning fallacy is institutionalized. Those who benefit from low estimates need not lie; just announce a project early in perfect confidence that estimators have failed to put a price on poor scope definition. The paper subtitle should be “we have met the enemy and he is us”.

The paper reviews the cost overrun situation, the theories, the research and the various proposed and recommended methods. Despite all evidence to the contrary, the author is hopeful that empirically-valid risk quantification and contingency setting practices will become more widely used, putting an end to endemic cost overruns in the transportation industry.

(TCM-3654) Untangling the Control Baseline and the Authorized Funding Budget Concepts in the Capital Projects Environment

Author(s)/Presenters(s): Ghaith Al-Hiyari, CCP; Sedat Akkaya



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(Subject to change–Rev. 2021-05-12)

Level: Basic

TCM Section(s):

9.1. Project Cost Accounting

9.2. Progress and Performance Measurement

Type: Live webinar

Abstract: The term budget has become an ambiguous concept in the world of capital projects. It is often used, interchangeably, to describe a variety of distinct concepts. The most notable of those are the project cost control baseline and the authorized funding for expenditure. These two concepts are easily confused in the everyday language of capital projects. While the cost control baseline and authorized funding for expenditure (AFE) may intersect at various stages of the project lifetime, they are distinct concepts that must be defined, delineated, and managed independently.

The authors have noticed that some asset owner organizations are not aware of the differences in the definitions and applications of these concepts. This lack of awareness, if ignored, can jeopardize the effectiveness of the project cost control function and its elemental role as an indicator of the project performance and health status.

The purpose of this paper is to eliminate the ambiguity surrounding the various concepts encompassed within the budget terminology in the capital projects environment, and to highlight the benefits of distinguishing between the authorized funding and cost control baseline processes. The paper will also touch base on where these two concepts intersect and deviate, and present how these two processes can be utilized more effectively in the management of capital projects.

(TCM-3670) Integrated Construction Management Work Logic Diagram for Shanghai Theme Park Project

Author(s)/Presenters(s): Lan Zhang; Kai Wang; Xuefeng Wang; Hao Hu

Level: Basic

TCM Section(s):

2.4. Project Control Process Map

11.2. People and Performance Management

Type: Pre-recorded presentation



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(Subject to change–Rev. 2021-05-12)

Abstract: Projects often miss original targets, owing to the project schedule, cost, safety, quality, etc. being considered as separate elements in project management techniques. It is essential that the project leader and team are aware of the overall status of the project, so that individual focus and efficiency can be attained. A logic diagram in which the construction main theme and the elements are visually presented on the same page will aid stakeholders to understand the overall status of the project, focus on important issues, and efficiently distribute work within team members.

The initial part of this study involves a typical sequence of the phases in a project life cycle from the PMI Project Management Body of Knowledge (PMBOK), replacing the phases with production as the main theme and including pre-condition work as inputs and the completed work as outputs. Additionally, constraints of safety, quality, and cost are applied to form an integrated construction management work logic diagram. The diagram was developed and executed for one of the five attractions at the Shanghai theme park project. The diagram is a visual control map that enables a project leader and the team to visualize the construction progress with workload distribution, interface, and elucidate the current status and relationships of quality, safety, cost, and other tasks, thus facilitating the progress of the project towards its targets.

The diagram transforms traditional construction management practices into a system that can be presented to the team and upper management with logic relationships, which will greatly aid in improved efficiency. At last a case study was provided that describes how the integrated construction management work logic diagram was developed to support project recovery for the Shanghai theme park project.

(TCM-3681) Cost Management Framework for Megaprojects - The Ten Elements

Author(s)/Presenters(s): Dr. Ahmed Ewida, P.Eng.

Level: Basic

TCM Section(s):

4.1. Project Implementation

7.1. Project Scope and Execution Strategy Development

Type: Pre-recorded presentation

Abstract: Delivering megaprojects within budget and on schedule is and has always been challenging. Due to the complexity of the key drivers and influential factors that impact most megaprojects,



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(Subject to change—Rev. 2021-05-12)

traditional project management practices are, in some cases, insufficient to handle today's challenges. This paper presents a comprehensive cost management framework for megaprojects that takes today's complex business environment, project influential factors, and key management processes into account.

The framework captures key systems, processes, and activities essential for achieving successful cost management, and consists of the following ten elements: (1) Project Key Drivers and Influential Factors; (2) Leadership and Project Governance; (3) Project Preparation and Organization Development; (4) Project Risk Management; (5) Project Interface Management; (6) Scheduling and Project Execution Plans; (7) Cost Estimating and Budgeting; (8) Cost and Schedule Controls; (9) Progress Monitoring and Reporting; and (10) Benchmarking and Independent Project Reviews.

Deficiencies in, or lack of proper development and implementation of, any of the ten elements and/or associated systems and processes can cause significant risks to project cost management.

(TCM-3707) Where & Why Value Engineering Goes Wrong With Capital Projects

Author(s)/Presenters(s): Neil D. Opfer, CCP CEP PSP FAACE

Level: Basic

TCM Section(s):

7.5. Value Analysis and Engineering

Type: Pre-recorded presentation

Abstract: Value engineering (VE) as a technique was first developed in the U.S. during World War II to cope with the problems inherent with wartime shortages of key components. Since these shortages existed, innovative methods were required as a workaround to solve these problems. Larry Miles with General Electric is widely credited as the developer of this VE technique [2, page 1]. While the origins of value engineering were in U.S. manufacturing, the technique has spread to numerous other areas including retail, construction and services' sectors in both the U.S. and the World. VE has also taken on other names including value analysis and value management. Whatever the name, VE has proven widely successful in a variety of areas in improving value. However, despite this success, there have been numerous instances where VE has not been successful or those invoking the VE name incorrectly implement the technique or do not really practice VE but still term it VE. As a result, many across a variety of sectors view VE as simple cost reduction technique. Based on this writer's extensive experience in VE on numerous VE teams related to capital projects over the years and discussions with



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(Subject to change–Rev. 2021-05-12)

numerous practitioners in the construction industry, this paper grew out of this. The information from this work has been distilled into twenty categories related to capital construction projects.

(TCM-3747) Better Project Control Through Better Project Execution

Author(s)/Presenters(s): Richard P. Helper, PSP

Level: Basic

TCM Section(s):

9.2. Progress and Performance Measurement

10.1. Project Performance Assessment

Type: Live webinar

Abstract: Project controls have been a primary focus of project improvement for decades. Organizations such as AACE have published a library of knowledge and recommended practices on estimating, cost control, scheduling, and risk management. Each year, new software capabilities are introduced promising more data integration and collaboration than ever before. Experts in CPM scheduling and risk management have developed sophisticated algorithms to attempt to correct for inaccurate estimating and project controls information. Perhaps it is time to think beyond collecting data, performing analysis and publishing reports or charts. Interestingly, the most recent updates to AACE recommended practices are revised to include more granular definitions of deliverables. What if there were much better definition of deliverables? And what if those deliverables could be chronologically mapped; showing internal and external dependencies – all in a stage gated environment? This paper will focus on how to improve project controls reliability using project execution processes for engineering, procurement, construction, and commissioning. Project execution processes qualitatively prescribe criteria required to earn progress. Subsequently, this yields improved reliability of progress data collected, which subsequently results in increased reliability of project controls analysis and reporting.

(TCM-3756) Recommended Practice for Project Historical Database Development

Author(s)/Presenters(s): John K. Hollmann, PE CCP CEP DRMP FAACE Hon. Life; Peter R. Bredehoeft, Jr. CEP FAACE



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Level: Intermediate

TCM Section(s):

6.3. Asset Historical Database Management

10.4. Project Historical Database Management

Type: Live webinar

Abstract: The value of good project historical data and metrics for use in project planning (estimating, planning and scheduling, risk analysis, etc.) has always been recognized by cost engineers. The AACE library includes examples of successful implementations. However, the challenges of developing and maintaining a database (sustained demands on resources and budgets and extended time to achieve objectives) have resulted in relatively few companies successfully implementing them. However, increasing interest in artificial intelligence (AI), analytics, business intelligence tools and the availability of commercial software has raised interest. This interest resulted in the development of the subject Recommended Practice (RP). The RP is a guideline for requirements assessment, specification, development, implementation, and maintenance of a project historical database system. A database maturity model is also included. The intended audience is owner, contractor and agency organizations having access to project estimate and/or actual data. The main focus is on databases for estimating, planning and scheduling, and risk management uses (e.g., estimate validation, conceptual estimating and scheduling, parametric risk modeling, etc.). However, databases may also support resource planning, project system benchmarking and performance improvement, forensic analysis, and other processes in the TCM Framework.

(TCM-3775) Strategic Portfolio Management: Asset Management Model

Author(s)/Presenters(s): H.Lance Stephenson, CCP FAACE

Level: Basic

TCM Section(s):

3.2. Asset Planning

5.2. Asset Performance Measurement

Type: Pre-recorded presentation

Abstract: Asset management is considered the operational, risk, and financial methodologies that promote the total means and methods of production and delivery of the entire asset base. Based on these considerations, the author would like to present the management of a portfolio of assets and not



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that of a single asset. This portfolio creates the opportunity to balance operational needs based on business strategy and objectives.

The author of this paper provides some recommendations for implementing an asset management model for improving asset development, implementation, and administration at the portfolio level. This paper also provides the audience with the necessary direction for ensuring effective and efficient operations by identifying experiences and corrective actions through a shared asset management network. This paper will provide readers with the following:

- The implementation of an asset management approach that will assist in asset development optimization.
- An understanding of asset management, life cycles, and life cycle management at the portfolio level. This understanding includes introducing techniques for top-down and bottom-up assessments while matching the needs for long-term, short-term, and routine operations.
- A relevant asset portfolio hierarchy and process designed to support operational assessments for the portfolios of assets.

(TCMA-3603) Supplier Selection with AI-Based TCO Models: Cost Prediction Case Study at an Automotive OEM

Author(s)/Presenters(s): Jan Martin Spreitzenbarth; Dr. Heiner Stuckenschmidt

Level: Advanced

TCM Section(s):

10.4. Project Historical Database Management

11.3. Information Management

Type: Pre-recorded presentation

Abstract: The goal of this research is to understand more clearly the lifecycle costs of supplier selection using methods of artificial intelligence (AI) with a total cost of ownership (TCO) model to reduce uncertainty and make better decisions. AI is a key technology for operations management and its usage is still in its infancy. Few have successfully integrated AI methods into their operations and across their supply chains but are recently starting to emerge. The research is driven by the question of how to reduce uncertainty to provide better information for selecting the right supplier. A case study is conducted at a German automotive manufacturer based on three interlinked data sets. These include:



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1. Naïve algorithm models are evaluated as baselines for quality of cost prediction based on supplier selection nomination.
2. Engineering and production changes are analyzed since they often lead to price increase.
3. Cost breakdowns are considered, as they are applicable during several lifecycle phase.

For the last 50 years, AACE International and the project management community have made significant contributions to increase the maturity in the practice of project management and control. This continuous commitment applies to remain resilient in the era of data science. This study suggests practical ways to break down uncertainty into a measurable quantity. References are drawn from the Total Cost Management Framework and the applicability is discussed to other settings such as construction, aerospace, defense, and public procurement where considerable related research is conducted. The work confirms previous research that in particular regression trees and Bayesian optimization can reduce the uncertainty inherent in supplier selection more than previously utilized methods.

(TCMA-3651) Once Upon a Project: Using Data to Tell the Story

Author(s)/Presenters(s): Susan Bomba, PE; Aleshia Ayers, PE

Level: Basic

TCM Section(s):

2.4. Project Control Process Map

10.4. Project Historical Database Management

Type: Pre-recorded presentation

Abstract: Effective reporting involves aggregating accurate and timely information and using the data to tell the story of the project. As data is in abundance and software programs abound to transform the data into eye-catching graphics, it's critical to create effective reporting that focuses on their intended purpose. Reporting and data analysis play key roles in decision making and ultimately make a significant difference in how project health is communicated throughout the organization. By viewing reports as a communication tool instead of a static documentation of status, the project owner can translate key performance indicators and metrics into meaningful information that is actionable. This will allow the discussion to be more focused and help leadership to better understand the health and needs of a project as well as any risks to the broader organization.



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This paper will focus on four key areas to consider when developing reports: assessing effectiveness of key performance indicators, data automation and management, adapting the visual layout for clear data presentation, and integration of business intelligence and data visualization solutions. Using data to tell the project story will result in more effective project management and create a lasting impact.

(TCMA-3674) The Impact of AI-Driven Project Management on an Organization's Decision-Making Culture

Author(s)/Presenters(s): Marcus Glowasz

Level: Intermediate

TCM Section(s):

10.4. Project Historical Database Management

11.3. Information Management

Type: Live webinar

Abstract: The project management industry is continuously facing challenges with rather low project success rates, which therefore demands a new intelligent approach to how projects are being managed and delivered. Artificial intelligence (AI) represents a welcomed opportunity for the project management practice to improve its service quality, to address its existing shortcomings with project deliveries and increase the efficiency of projects.

Accordingly, AI in project management is expected to enter and revolutionize the project management industry over the next months and years. This new reality however means also dramatic change for an organization regarding its decision-making and project culture since this will mean a fundamental change in the beliefs and behaviors of project professionals.

The paper aims to investigate the key elements of an AI-powered project management approach and how it will impact project management practitioners and their norms and values in terms of decision-making in projects. Based on the findings, a recommended approach will be drafted to transition to an adjusted cultural setting that fits in a wider data-driven organizational culture, to improve the predictability of project outcomes.



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(TCMA-3733) Analytics of What? Implications of Industrial Megaprojects Complexity in Data-Driven Forecasting

Author(s)/Presenters(s): Pouya Zangeneh, P.Eng.; Murray Pearson, P.Eng.; Dr. Brenda Y. McCabe, P.Eng.; Leslie E. McMullan, FAACE

Level: Intermediate

TCM Section(s):

10.4. Project Historical Database Management

11.3. Information Management

Type: Live webinar

Abstract: The fourth industrial revolution has led to widespread digitalization across the delivery chain of construction and project industries. The digitalization of project processes and other technological enhancements such as digital project delivery, building information modeling, and digital twins have created vast amounts of promising data. At the same time, data science, artificial intelligence, and machine learning are becoming ever more streamlined and available for a variety of tasks, raising debates and discussions about what is project analytics and how analytics processes and functions can create a competitive advantage. Systematic approach to this issue requires a holistic view into three aspects of it: first, inherent complexities of projects as complex and interdependent systems; second, nature of project delivery processes, management, and controls; and third, knowledge of high-performance analytical algorithms, tools, and trends in technological innovation. This paper provides an overview of the authors' experiences and perspectives on project complexities, and success factors in dealing with such complexities. A framework is then proposed for successful project analytics functions.