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Planning, Scheduling and Cost Estimation Skills for Public Sector Projects

Course Overview

The late delivery of projects has become the scourge of project professionals worldwide. Countless numbers of projects undertaken by organizations in the private and public sectors significantly overrun the project schedule and budget, and as a consequence fail to achieve the organization's financial and strategic objectives, often with sizable increases in costs and substantial financial losses to the organization. Why?

This is due mainly to the failure of many project professionals to successfully apply the tools and techniques of modern project planning, scheduling, and control to their projects. Likewise, the development of reliable cost estimates during the design and early conceptual stages of a proposed project is of critical importance to the success of the project.

The decision to proceed with a project is often based almost exclusively on early conceptual cost estimates, and these estimates provide the basis for the cash flow projections and forecasts used during the project feasibility study. Unreliable cost estimates can result in significant cost overruns later in the project life when it is too late to contain them.

In addition to the potential financial losses suffered by the organization, many such projects subsequently fail to deliver the required quality of outcomes intended for the project as a direct consequence of poor estimating. Budgeting inaccuracies inevitably result in lower-quality workmanship and materials.

The estimating techniques and processes covered in this course will provide delegates with the necessary skills to forecast accurately the anticipated costs of projects with a focus on budget estimates, estimates for pre-construction services, estimating contractor and sub-contractor work, estimating general conditions, pricing self-performed work, estimating negotiated contracts, and performing lump sum and unit-price estimates.

This course will significantly enhance the skills and knowledge of delegates and improve their ability to properly plan and schedule their projects, as well as perform estimates at both the conceptual and detailed levels, and compare feasible alternatives quickly and efficiently.

Course Objectives:

At the end of this course, the participants will be able to:

- Integrate scope, time, resources and cost management into a dynamic, manageable plan
- Develop project network diagrams for CPM and advanced PERT calculations to identify schedule and cost risks
- Maintain continuous project performance and delivery control
- Estimate and allocate project costs and resources
- Measure, forecast and control project performance by employing earned value techniques
- Accelerate the schedule when required by adverse circumstances
- Manage and mitigate schedule, cost, scope, and resource risks associated with the project
- Develop a line of balance schedules and velocity diagrams for repetitive or recurring work
- Benefit from the financial effects of the learning curve on recurring work
- Develop a project recovery plan for budget and schedule overruns
- Produce clear and concise project progress reports
- Integrate all relevant project elements into a cohesive and comprehensive cost estimate
- Prepare budget estimates that will enable the owner-organization to make informed decisions as to the feasibility of a potential project
- Compare the costs of alternative strategies or technical approaches to ensure the most economical project at the desired level of quality
- Structure of the contract compensation arrangement to provide the highest level of incentives to complete the project on schedule and within the determined budget
- Keep accurate control of the progressive budgeting process based on the various stages of design
- Prepare accurate budget estimates through the programming phase, the schematic design phase, and finally the design development phase
- Understanding the most appropriate contracting structure to ensure the desired project results
- Apply proper risk analysis to effectively mitigate risks at minimal costs, and to determine appropriate contingencies for residual risks
- Obtain the skills required to prepare and manage the bidding process
- Prepare lump-sum, unit-price, cost plus, and time-and-materials estimates and contracts

Course Content:

Unit 1: Project Scope Planning and Definition (Fundamentals):

- Scope Planning
- Work Breakdown Structures (WBS)
- Work Packages
- Statement of Work (SOW) - Technical Baseline
- Scope Execution Plan
- Triple Constraints - Time, Cost, Scope
- Project Quality Issues
- Project Risk Analysis
- Project Deliverables
- Resource Requirements

Unit 2: Project Schedule Planning and Critical Path Method:

- Precedence Network Diagramming
- Job Logic Relationship Chart
- Critical Path Analysis
- Project Float Analysis

- Lead and Lag Scheduling
- Activity Duration Estimation
- Milestone Charts
- Gantt Chart - Schedule Baseline
- Project Estimating Processes
- Production and Productivity Planning
- Resource and Cost Allocation
- Unit 3: Resource Allocation and Resource Levelling:
- Management of Resources
- Planning and Scheduling Limited Resources
- Resource Allocation Algorithms for Resource Prioritisation
- Solving Resource Contention
- Resource Levelling when Project Duration is Fixed
- The Brooks Method of Resource Allocation
- Increasing the Workforce
- Solving Interruptions to the Schedule
- Scheduling Overtime

Unit 4: Accelerating the Project Schedule:

- Circumstances Requiring Project Acceleration
- Time-Cost-Scope Trade-off
- Project Time Reduction
- Direct Project Costs
- Indirect Project Costs
- Options for Accelerating the Schedule
- Crashing the Schedule - How?
- Pre-Accelerated Schedule
- Developing a Crash Cost Table
- Acceleration in Practice
- The Optimal Acceleration Point
- Gantt Chart for Accelerated Schedule
- Network Activity Risk Profiles
- Additional Considerations
- Multiple Critical Paths
- Project Cost Reduction

Unit 5: Project Contingency Planning:

- Program Evaluation and Review Technique (PERT)
- Path Convergence Analysis
- Solving the Path Convergence Problem
- Network Risk Profile Types
- Normal Distribution
- PERT, Probability and Standard Deviation Formulae
- Calculating the Standard Deviation
- Standard Deviation for Critical Path
- Z-Values: The Probability of Project Completion at a Required Date
- True Critical Path
- Network Activity Risk Profiles
- Application: Estimating Project Duration

Unit 6: Line of Balance Scheduling - The Planning of Recurring Activities:

- Preparing a Line of Balance Schedule
- Velocity Diagrams and Linear Scheduling
- Velocity Diagram Production Rate Calculations
- Linear Sequence of Activities as a Series of Velocity Diagrams
- Balancing the Schedule
- Calculations for a Line of Balance Schedule
- Line of Balance Formulae
- Target Units per Week
- Determining Crew Size
- Actual Rate of Output
- Time to Complete One Activity
- Elapsed Time for Recurring Activity
- The slope of Line from Activity Start to Activity Finish
- Balanced Project Schedule without Buffers (Finish-Start)
- Inserting Buffers
- Comparison of Unbalanced with Balanced Schedules
- Measuring Planned Progress on Schedule
- Velocity Diagram Reflecting Expected Conditions
- Actual Progress and Work Conditions
- Variable Conditions

Unit 7: Project Execution Management, Control and Reporting:

- Progress Tracking and Monitoring
- Project Cost Management
- Earned Value Control Process
- Schedule Variances
- Cost Variances
- Progress Control Charts - Trend Analysis
- Schedule and Cost Variance Forecasting
- Labour Management and Cost Control
- Materials Management and Cost Control
- Earned Value Analysis
- Earned Value Reporting

Unit 8: Project Recovery Plan Development:

- Project Variance Analysis and Quantification
- Schedule Performance Index (SPI)
- Cost Performance Index (CPI)
- Setting Schedule and Cost Control Limits
- Project Recovery Data Assessment
- Schedule and Cost Recovery Analysis
- Schedule and Cost Recovery Plan
- Project Recovery Baselines and Controls

Unit 9: Cost Estimating Basics:

- The estimated life cycles
- Phases of the Design Process

- Programming phase
- Schematic design
- Design development
- Construction documents
- Estimating accuracy by phase
- Conceptual Cost Estimates
- Rough Order of Magnitude Estimates (Broad Scope Estimates)
- Assemblies cost estimates
- Cost indices
- Semi-detailed Estimates (Narrow Scope Estimates)
- Definitive Estimates (Detailed Scope Estimates)
- Basic procedures
- Lump-sum contracts
- Unit-price contracts
- Cost-plus contracts
- Cost-plus contract with the guaranteed maximum price (GMP)
- Time-and-Materials contracts
- Bid method
- Negotiated method
- Quantity take-off
- Types of construction contracts
- Procurement methods
- Pre-construction services
- Risk Analysis and Contingencies

Unit 10: Broad Scope Cost Estimating Techniques:

- Adjustments to Project Cost for Broad Scope Estimates
- PERT Project Cost Analysis
- PERT Unit Cost Estimates
- Formulae for Cost Estimating
- The Normal Distribution Curve
- Z-Value Table
- The Probability of Project Completion Within Budget
- Estimating Project Unit Cost by Using the Standard Deviation
- Estimating the Project Unit Cost at a Required Probability
- The Probability of Completing the Project at a Required Cost
- PERT vs Standard Deviation & Z-Values
- Adjustments to Estimates Based on Previous Projects
- Adjustments for Time
- Review: Future Value of Money
- Review: Present Value of Money
- Equivalent Annual Interest Rate
- Index to Adjust for Time
- Equivalent Compound Interest
- Location Index for Construction
- Adjustments for Location
- Adjustments for Size
- Combined Adjustments
- Economic Price Adjustment
- Estimating Durations based on the Learning Curve Effect

- Estimating Costs Based on the Learning Curve Effect
- Unit-Cost Adjustments
- Learning Curves

Unit 11: Budget Estimating Process:

- Estimating by design phase
- Programming budget estimates
- Schematic design budget estimates
- Design development budget estimates
- Estimating pre-construction services
- Request for proposal
- Development of pre-construction services estimate
- Pre-construction services contract
- Budget control log

Unit 12: Bid Contract Estimating Process

- Pre-estimate activities
- Estimating process
- Solicitation of lump-sum bids
- Order-of-Magnitude estimates
- Work Breakdown Structure
- Estimating team
- Scheduling the estimating work
- Subcontractors and major suppliers
- Estimating forms
- Accuracy and error prevention
- Pricing self-performed work
- Recap sheet
- Materials
- Labour
- Applying pricing factors
- Summary recap
- Subcontractor work
- Project summary schedule
- Alternative techniques
- Elements of the estimate of the general condition
- Final document review
- Completing the bid summary
- Final mark-ups
- Sales tax
- Validating the estimate
- Estimating subcontractor work
- Estimating General Conditions
- Completing the estimate

Unit 13: Unit Price Estimates:

- Unit price bid forms
- Direct cost estimation
- Materials

- Labour
- Indirect labour
- Subcontractors
- Recap summary sheet
- Direct-to-indirect cost factor
- Mark-up determination
- Variation-in-quantity contract provision
- Risk analysis
- Bid finalization

Unit 14: Negotiated Contract Estimating:

- Guaranteed Maximum Price Estimates
- Contract procurement process
- Documents
- Strategies
- Estimating process
- Contingencies
- Fee determination for negotiated contracts
- Reimbursable versus Non-reimbursable costs
- Home office overhead
- Risk evaluation
- Fee structure
- Cost savings split
- Strategies for Responding to the Request for Proposal
- Documents to be included with the Request for Proposal
- General Contractor Interview and selection process
- Negotiated subcontracts
- Cost proposals for negotiated contracts

Unit 15: Contract Types and Compensation Arrangements:

- Risk distribution in contracting
- Project risk profiles
- Contract types according to risk distribution
- Fixed Price Contracts
- Firm Fixed Price
- Fixed Price with Economic Adjustment
- Incentive Contracts
- Fixed Price Incentive
- Cost Plus Incentive
- Cost Reimbursement
- Cost Plus Award Fee
- Cost Plus Fixed Fee
- Cost-Plus Contracts
- Time-and-Materials

Unit 16: Narrow Scope Cost Estimating Techniques:

- Power-sizing techniques (Capacity Ratios)
- Factor estimates
- Cost estimating relationships (CER)

- Design-to-cost-estimates
- Target cost estimates
- Adjusting for Project Type and Quality Level
- Features Determining the Quality Level (Grade) of a Structure
- Adjusting for Quality Level by Using a Costing Publication
- Economic Constraints
- Parametric Cost Estimating
- Analysis of Estimating Accuracy

Targeted Groups:

- Project Managers
- Project Cost Estimators
- Cost Controllers
- Project Planners
- Contract Professionals
- Project Procurement Staff
- Individuals who are interested in Project Initiation, Project Estimating and Budgeting, and Development

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