CEP CERTIFICATION

Overview

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Girish P Dhavalikar

- 30 plus years of experience in Cost Engineering & Project Management for Oil & Gas, Power & Industrial Projects
- PMI ATP Instructor, Level 3 Assessor, Facilitator, Visiting Faculty, SME (Oil & Gas and Power) (Since Oct 2018)
- Certified Cost Professional (2004)
- Project Management Professional (2010)
- Level 3 CAVA (2021)
- AACE India, Region 8 (Asia Pacific)
- PMI Pune Deccan India Chapter

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About AACE

AACE

- Established in 1956
- AACE International is the Association for the Advancement of Cost Engineering.
- It serves over 10,000 members and certified professionals in 100 countries.
- Cost Engineering is a field of study using integrated means and methods to enable sound decision making in enterprise asset management.
- AACE's Body of Knowledge is developed, refined, and deployed by industry professionals worldwide.

Certification Offered

Three Levels of Certification

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Certification Offered

Three Levels of Certification

- Certified Forensic Claims Consultant (CFCC)
- Decision & Risk Management Professional (DRMP)

- Certified Cost Professional (CCP)
- Certified Estimating Professional (CEP)
- Earned Value Professional (EVP)
- Planning & Scheduling Professional (PSP)

- Certified Cost Technician (CCT)
- Certified Scheduling Technician (CST)

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Certified Estimating Professional Certification (CEP)

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AACE's Certification

- Tests and Certified that a CEP meets :
  - Minimum experience and knowledge criteria
  - Required expertise in Certified Estimating Professional
    - Professional experience requirement
    - Documented education criteria
    - Ethical standards
    - Passing Examination
  - Acceptable standards for best management practices

CEP Certification

- Recognizes specialists who meet demanding set of cost and management criteria
- Distinguishes cost professional who have the knowledge and skills to impact the bottom line
- CEP designation is mark of expertise
  - Is a mark of distinction
- Accredited by Council of Engineering & Scientific Specialty Boards (CESSB)

Requirements

- Experience requirement
  - 8+ full years of professional experience (4 years may be substituted by college/university degree)
- Application & Fees
  - AACE members $500 / Non-members $625
- Submit application 45 days in advance of exam
  - Documented experience / education is reviewed and verified
  - Must take exam within 6 months of registration
  - Resit fee $250 applicable up to 6 months from registration

Requirements

- Examination
  - Closed book
  - Computer based online test at Kryterion exam center
  - 119 Questions (Basic Knowledge (50 Q), Complex Problems (24 Q), and Process & Practices (45 Q)
  - Pass / Fail : 70%
  - Overall 5 hours duration
  - 1 Memo writing assignment
  - Validity 3 years

Preparation Guidance

- AACE's reference materials
  - Total Cost Management Framework, 2nd Edition
  - Skills & Knowledge of Cost Engineering, 6th Edition
  - CEP Certification Study Guide, 2nd Edition
  - Recommended Practice 11R-88, Required Skills & Knowledge of Cost Engineering, 2006
  - Cost Engineering Terminology 10S-90
- Supplemental reading
  - AACE Professional Practice Guides (PPG)

Preparation Suggestions

- Examination
  - ➢ Apply sound test-taking tactics
    - – Read through exam & do problems of greatest comfort first
    - – Allocate time proportionally to value of problem
  - ➢ Study & work example problems in all areas
  - ➢ Master financial calculator before exam
- Memo Writing Assignment
  - ➢ The question will identify your position, description of the project and general scope of the question. Review the documentation required in the listing and prepare the memo.

Recertification Process (Every 3 years)

- Designed to ensure that professional has maintained continued expertise through
  - Work experience
  - Continued education
  - Professional development
  - Active involvement in the profession
  - Earning 12 CEU (Continuous Education Unit)
- Re-examination
- Single point credits and fees for multiple certifications

SKILLS AND KNOWLEDGE OF COST ESTIMATING

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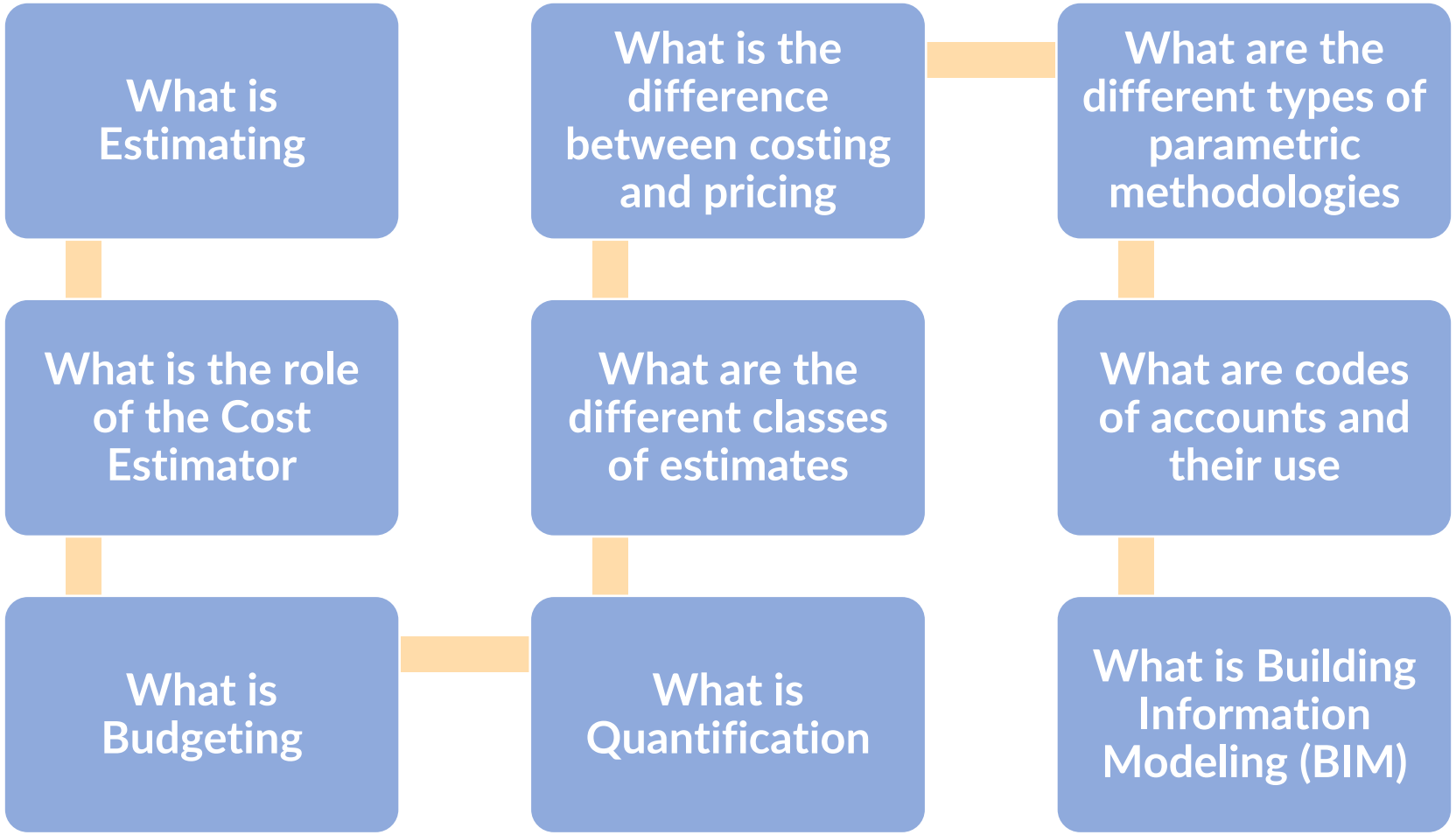
S & K OF COST ESTIMATING

1. Supporting Skills & Knowledge
2. Cost Estimating Skills & Knowledge
   - 2.1 General Estimating Concepts
   - 2.2 Estimating Processes and Practices
   - 2.3 Other Estimating Issues
3. Additional Studies

WHAT IS ESTIMATING



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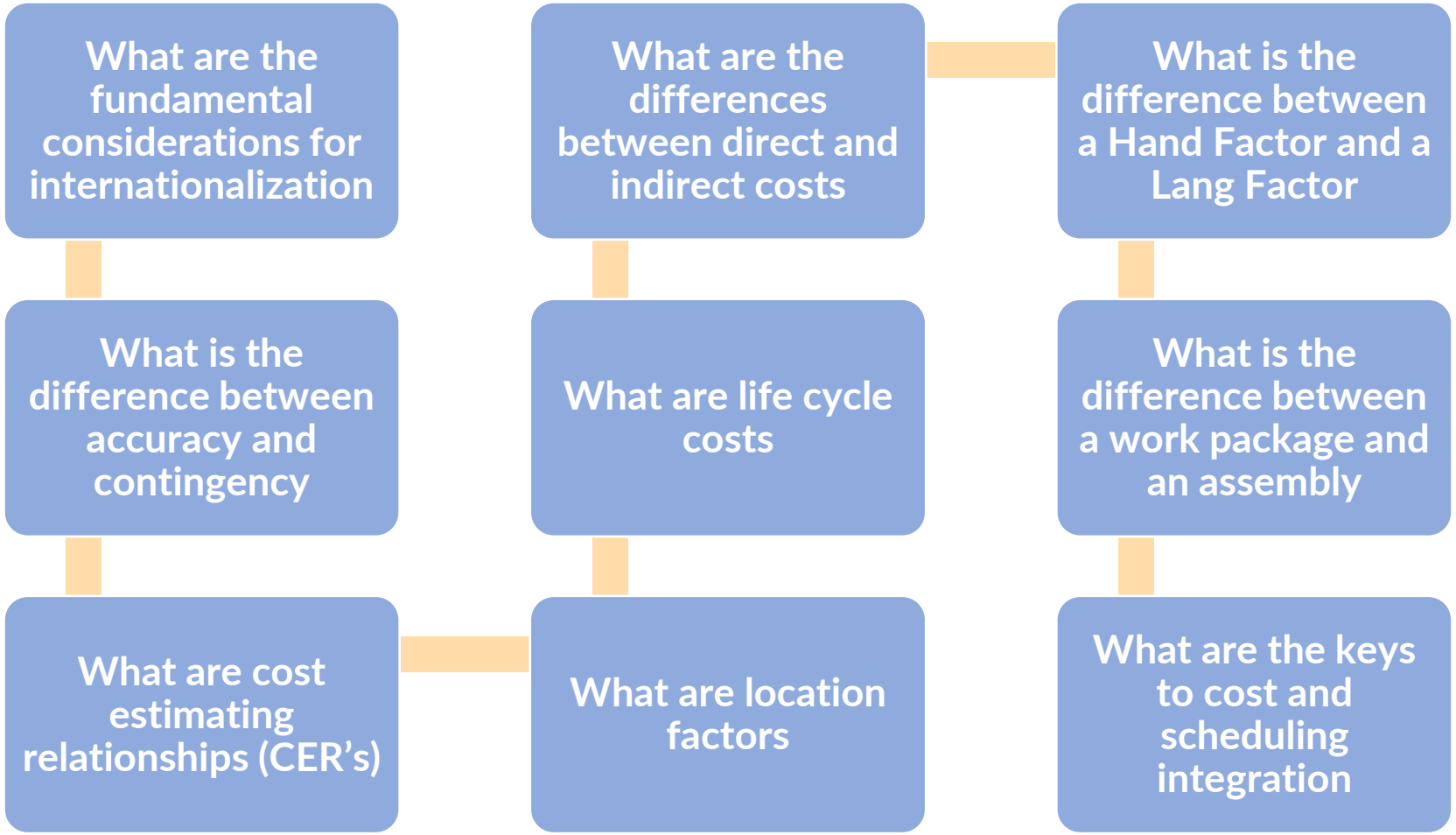
WHAT IS ESTIMATING



WHAT IS ESTIMATING

- What are some of the challenges for change order estimating
- What is the difference between a composite & average crew rate
- What are the differences between bare rates and burdened rates
- What are the different types of work breakdown structures (WBS)
- What is the difference between unbalancing and front end loading
- What is the difference between material unit price and material price
- What is the difference between labor productivity and productivity factor
- How does change order estimating differ from project estimating
- What is the importance of project cash flow

Cost Estimator

- Project cost estimators predict the cost of a project for a defined scope, to be completed at a defined location and point of time in the future.
- Cost estimators assist in the economic evaluation of potential projects by supporting the development of project budgets, project resource requirements, and value engineering.
- Cost estimators also support project control by providing input to the cost control baseline

Cost Estimating

- The predictive process used to quantify, cost, and price the resources required by the scope of an investment option, activity, or project.
- Cost estimating is a process used to predict uncertain future costs. In that regard, a goal of cost estimating is to minimize the uncertainty of the estimate given the level and quality of scope definition.
- The outcome of cost estimating ideally includes both an expected cost and a probabilistic cost distribution.

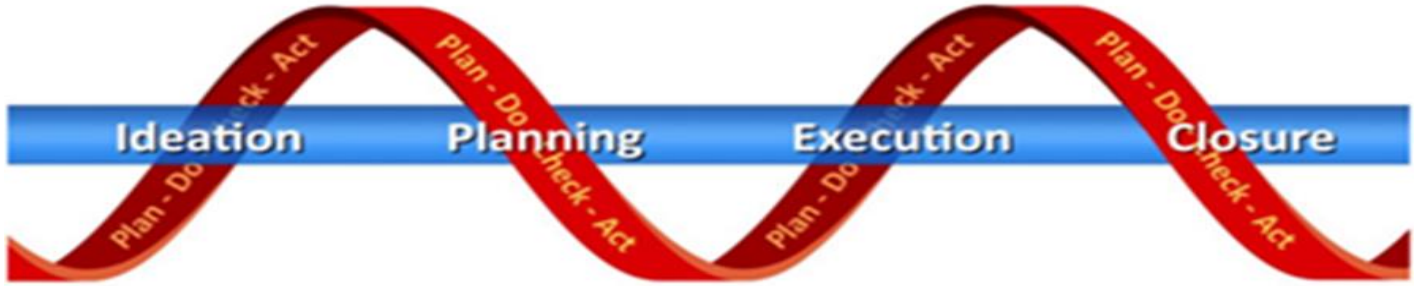
SUPPORTING SKILLS AND KNOWLEDGE

Supporting Skills and Knowledge

- Elements of Cost
- Elements of Analysis
- Enabling Knowledge

Elements of Cost

- Direct cost
- Indirect cost
- Variable cost
- Fixed cost
- Capital cost
- Depreciation
- Life cycle costs



Project Life Cycle

Choose the Right Project		Develop the Right Project		Deliver the Project Right		Terminate the project
Appraise Determine project feasibility and alignment with business strategy	Gate	**Select** Select the preferred project development option	Gate	**Define** Finalise the project scope, cost and schedule and get the project funded	Gate	**Execute** Produce an asset consistent with scope, cost and schedule	Gate	**Operate** Evaluate asset to ensure performance to specification and maximum returns	Gate	**Terminate** Terminate the project
• Post Conceptualisation • Feasibility Study • Technology Assessment		• Concept Development & Selection • Initial Cost Estimating • Strategic Plan • Project Selection Criteria • Historical information		• Basic Engineering • Detailed Cost Estimating • Execution Planning		• Detailed Engineering • Execution • Construction Management • Testing & Commissioning • Upgrades & De-snagging		• Operation and Maintenance Support		• Terminate the project
Project Management		Project Management		Project Management		Project Management		Project Management		Project Management

Elements of Analysis

- Statistics and probability are a fundamental basis for the analysis of projects and costs in that there are patterns and consistencies
  - Learning curve
  - Pareto's Law
  - Risk Analysis
  - Standard deviation
- Economic analysis
- Optimisation

Enabling Knowledge

- Enterprise in Society
  - Societal values – societal concerns and needs
  - Decision policies – consideration of societal values
  - Ethics – rules of conduct, AACEI's cannon of ethics
- People and Organisations in Enterprises
  - Leadership
  - Organisation structure
- Information management
- Value management

GENERAL ESTIMATING CONCEPTS

General Estimating Concepts

- Cost Estimating Terminology
- Cost Estimate Classification
- Estimate Variability
- Uncertainty
- Estimating Algorithms
- Code of accounts
- Historical Data

Cost Estimating Terminology

- Recommended Practice RP10S-90, Cost Engineering Terminology
- Learn not only Cost Estimating Terminology, but also the basic terms of other disciplines, e.g.
  - Battery limit
  - Accrual
  - Acts of God (Force majeure)
  - Amortisation

Cost Estimate Classification

	Primary Characteristic	*Secondary Characteristic*			
ESTIMATE CLASS	**MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical +/- range relative to index of 1 (i.e. Class 1 estimate) [a]	**PREPARATION EFFORT** Typical degree of effort relative to least cost index of 1 [b]
Class 5	0% to 2%	Screening or feasibility	Stochastic (factors and/or models) or judgment	4 to 20	1
Class 4	1% to 15%	Concept study or feasibility	Primarily stochastic	3 to 12	2 to 4
Class 3	10% to 40%	Budget authorization or control	Mixed but primarily stochastic	2 to 6	3 to 10
Class 2	30% to 75%	Control or bid/tender	Primarily deterministic	1 to 3	5 to 20
Class 1	65% to 100%	Check estimate or bid/tender	Deterministic	1	10 to 100

Notes: [a] If the range index value of "1" represents +10/-5%, then an index value of 10 represents +100/-50%.
[b] If the cost index value of "1" represents 0.005% of project costs, then an index value of 100 represents 0.5%.

General Estimate Classification

Estimate Class

- Primary Characteristic
  - Maturity Level
- Secondary Characteristics
  - End Usage
  - Methodology
  - Accuracy
  - Preparation Effort

General Estimate Classification

Types of Estimates

Estimate Type	Design Completion	Accuracy
Order of Magnitude	0-5%	+50% to -30%
Budget	10-15%	+30% to -15%
Definitive	45-100%	+15% to -5%

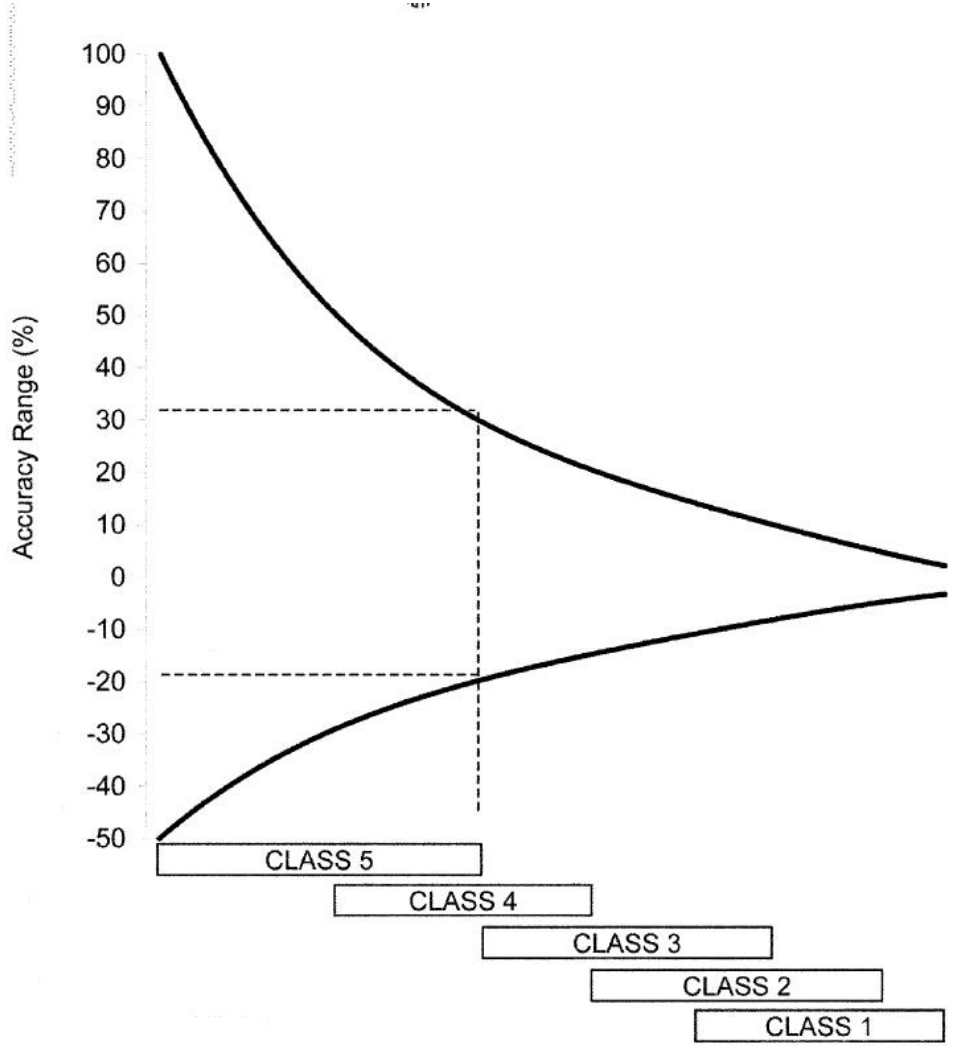
Estimate Variability

- The extent to which data points in a statistical distribution or data set diverge from the average or mean value.
- Factors influencing variability (e.g.)
  - Craft Skills
  - Weather
  - Overtime
  - Site conditions

Uncertainty

- The total range of events that may happen and produce risks (including both threats and opportunities) affecting a project. (Uncertainty = threats + opportunities.)
- All events, both positive and negative whose probabilities of occurrence are neither 0% nor 100%. Uncertainty is a distinct characteristic of the project environment.

Uncertainty



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Estimating Algorithms

- A procedure that produces the answer to a question or the solution to a problem in a finite number of steps.
- Tools used generally in the development of class 4 or 5 estimates before detailed drawings and specifications are available and use independent variables.
- Variables are not usually direct measures of the detailed elements of the project in the early stages.
- Mathematical models based on relationship between costs and other important parameters of the project

Order of Magnitude Estimate (Class 5&4)

- Quick method of determining an approximate probable cost of a project without detailed scope definition
- Estimates made without detailed engineering data.
- Estimate from cost capacity curves, an estimate using scale-up or scale-down factors, and an approximate ratio estimate
- Usually applied when the design is up to 5% complete
- Accuracy ranges from +50% to –30%

Order of Magnitude Estimate (Class 5&4)

- Purpose
  - Determine project feasibility at early stages of research or design development
  - Decide among competing alternatives in economic studies
- Prepared using a variety of techniques including:
  - End Product Unit Method
  - Scale of Operations Method
  - Ratio or Factors Method
  - Physical Dimensions Method
  - Parametric Estimates

Budget Estimate (Class 3 & 2)

- The word budget applies to the owner's budget and not to the budget as a project controls
- Budget cost estimating may be defined as a very deliberate method of determining probable cost of a project with benefit of scope definitions for systems & assemblies of the project
- Based on flow diagrams, general arrangement drawings, layouts & preliminary equipment descriptions & specifications
- Applied when design is 5% to 20% complete
- Accuracy ranges from +30% to –15%

Budget Estimate (Class 3 & 2)

- Purpose
  - Control design development by establishing cost ceilings within owner's financial limitations for project
  - Establish cost limitations for project components & systems
  - Designer specifies what will be emplaced within financial constraints of budgeted amount
- Why it may fail
  - Inexperienced Project Managers & Estimators
  - Lack of Definitive Project Scope
  - Limited Budget for Estimate Preparation

Definitive Estimate (Class 1)

- Definitive estimating determines probable cost of a project within a narrow range with benefit of detailed scope definitions for work
- Defined engineering data required includes site data, specifications, basic drawings, detailed sketches & equipment quotations
- Usually applied when design is over 30% complete
- Accuracy ranges from +15% to -5%
- Class 2 & Class 1 estimates

Definitive Estimate (Class 1)

- Purpose
  - Apprise owner of likely actual project cost & in conjunction with a project schedule, anticipated cash flows
  - Reference estimate called as Independent Estimate to evaluate Contractor's bids
  - Firm Price Bid
  - Detailed control budget
  - Cost reporting & control
  - Final feasibility review

Code of Accounts

- Systematic coding structure for organizing and managing scope, asset, cost, resource, work, and schedule activity information
- Index to facilitate finding, sorting, compiling, summarizing, or managing information that the code is tied to
- Complete code of accounts includes definitions of the content of each account

Historical Cost Data

- Reliable historical cost data is essential to the production of realistic and reliable cost estimates.
- The cost estimator must have a thorough understanding of a third party database before using it.
- Database information must be regularly updated and must be in a useful format to be of use to the estimator.

ESTIMATING PROCESSES AND PRACTICES

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Estimating Processes and Practices

- Planning the Estimate
- Estimating Methodologies
- Quantification
- Costing
- Pricing
- Estimate Conditioning
- Risk Evaluation and Contingency Determination

Estimating Processes and Practices

- Estimate Documentation
- Estimate Reconciliation
- Estimate Review and Validation
- Estimate Reporting
- Estimate Closeout

Planning the Estimate

- Determine the purpose of the estimate
- Determine the needs of the stakeholders
- Determine the scope
- Identify responsibilities
- Prepare a timeline

Estimating Methodologies

- Stochastic - Situations or models containing a random element
- Conceptual
- Deterministic - Algorithm, model, procedure, process, etc., whose resulting behavior is entirely determined by its initial state and inputs, and which is not random

Quantification

- **Quantification** – an activity to translate project scope information into resource quantities suitable for costing
- **Take-off** - a specific type of quantification that is a measurement and listing of quantities of materials from drawings to support the estimate costing process and/or to support the material procurement process.

Costing

- The application of cost and resources to a quantified scope
- Process of determining actual costs from actual expenditures.
- The way costs are estimated and the way money is spent is rarely the same, making it necessary to analyze and redistribute actual expenditures to arrive at cost data that is useful for future estimating purposes.

Pricing

- In estimating practice, after costing an item, activity, or project, the determination of the amount of money asked in exchange for the item, activity, or project.
- Pricing determination considers business and other interests (e.g., profit, marketing, etc.) in addition to inherent costs.
- The price may be greater or less than the cost depending on the business or other objectives.

Conditioning

- **Estimate Conditioning**: Adjusting the estimate to ensure it conforms to contract general and special conditions, or other project conditions required for the project.
- **General Conditions**: requirements that are normally not unique to the project.
- **Special Conditions**: provisions in the contract that are peculiar to the project.

Risk Evaluation & Contingency Determination

- **Contingency:** Amount added to an estimate to allow for items, conditions, or events for which the state, occurrence, or effect is uncertain and that experience shows will likely result, in aggregate, in additional costs.
- **Risk Management**: A process for managing asset and project risks. In TCM, the process includes risk planning, risk assessment, risk treatment, and risk control.

Estimate Documentation

- **Basis of Estimate:**
  - Written documentation that describes how an estimate, schedule, or other plan component was developed and defines the information used in support of development.
  - Commonly includes, a description of the scope included, methodologies used, references and defining deliverables used, assumptions and exclusions made, and some indication of the level of uncertainty.

Estimate Reconciliation

- Reconciliation consists of resolving or otherwise reconciling variances between the estimate and any previous versions of the estimate, any alternative expectations of the value of the estimate, or any estimates based on a similar scope of work

Estimate Review and Validation

- Verify that the latest project schedule agrees with the estimate
- Examine the project administration, and home office cost
- Conduct a final constructability review to ensure that the methods of installation and construction are cost effective.
- Review the construction indirect costs to make sure they are reasonable.
- Procurement costs are reviewed in line with delivery schedule
- Ensure all required start-up and commissioning materials are included. This is often an area of costs that is overlooked

Estimate Reporting

- Estimate presentation to management includes the following report
  - Estimate summaries
  - Basis of estimate (BOE)
  - Estimate benchmarking report
  - Estimate reconciliation report
  - Estimate back-up

Estimate Closeout

- Estimate Closeout : the process of organizing and storing all information for an estimate for future use, to support the development of historical archives, and the development of estimating tools

OTHER ESTIMATING ISSUES

Other Estimating Issues

- Bidding
- Budgeting
- Project Vs Life Cycle Costing
- Cash Flow and Forecasting
- Cost Control Baseline
- Project Vs Product Costs

Bidding

- **Bidding**: the process of submitting a formal proposal to enter into an agreement to provide a service, product, or project in return for an identified price.

Budgeting

- Process of aggregating the estimated costs of individual activities or work packages to establish an authorised cost baseline
- Project budget includes all the funds authorized to execute the Project
- Project budget includes contingency reserves but excludes management reserves
- Cost baseline is the approved version of the time-phased project budget against which the cost performance will be measured and analysed.

Project and Life Cycle Costing

- **Life Cycle Costs**: Associated with an asset, and they extend the cost management beyond the acquisition (creation) of the asset to the use and disposal of the asset
  - Development
  - Construction
  - Startup
  - Operation and Maintenance
  - Removal / Termination
  - Salvage Value

Cash Flow and Forecasting

- **Cash Flow:** Inflow and outflow of funds within a project. A time-based record of income and expenditures, often presented graphically

- **Cost Forecasting:** Forecasts are predictions of the cost to complete or Estimate to Complete (ETC) for cost elements in progress or that have not started

Cost Control Baseline

- In project control, the reference plans in which cost, schedule, scope and other project performance criteria are documented and against which performance measures are assessed and changes noted.
- The budget and schedule that represent approved scope of work and work plan.

Project and Product Costs

- **Project Costs** - reflects all costs attributable to the project, including its share of home office overhead costs and any costs not directly attributable to the project (indirect costs)

- **Product Costs** - entail all costs attributable to delivery of the product including all direct costs plus overhead costs.

ADDITIONAL STUDIES

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Additional Studies

- Internationalization
- Building Information Modeling (BIM)
- Change Order Estimating

Internationalization

- Addresses specific challenges presented by estimating projects in the global environment
- These include differing cultures affecting work rules, holidays, and customs, variations in measurement systems, and in currency
- Define how changes in exchange rates can affect the accuracy of estimates

Building Information Modeling (BIM)

- Building Information Modeling (BIM) refers to a digital representation of the physical and functional characteristics of a facility.
- The dimensions for modeling are the information and geometry about a facility: 3D graphical modeling, 4D time modeling, and 5D cost modeling.
- BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during the facility's life-cycle.

Change Order Estimating

- **Change Order** – A document requesting and/or authorizing a scope and/or baseline change or correction.
- From the owner's perspective, it is an agreement between the project team and higher authority approving a change in the project control baseline.
- From a contractor's perspective, it is an agreement between the owner and the contractor to compensate for a change in scope or other conditions of a contract.

THANK YOU

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