

Cost Risk Estimating & Management Glossary

2022

The beginning of wisdom is the definition of terms.

Socrates (470 – 399 BCE)

Theorem 1: 50% of the problems in the world result from people using the same words with different meanings.

Theorem 2: the other 50% comes from people using different words with the same meaning.

S. Kaplan (1997)



Abbreviations

AACE	Association for the Advancement of Cost Engineering International (AACE International)
CEVP®	Cost Estimate Validation Process®
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FY	Fiscal Year
ISO	International Organization for Standardization
GSP	General Special Provisions
PMBOK™	Project Management Body of Knowledge (PMI's PMBOK) Third Edition
PMI	Project Management Institute Combined Standards Glossary
ROD	Record of Decision Revenue Operations Date (FTA)
TAG	Transportation Analysis Group
TDM	Transportation Demand Management
TPA	Transportation Partnership Act (Washington State Program of Projects)
TRAC	Transportation Center (WSDOT research center)
TSM	Transportation System Management

A

accountability	The quality or state of being accountable; <i>especially</i> : an obligation or willingness to accept responsibility or to account for one's actions. <i>The person having accountability for responding, monitoring and controlling risk is the risk manager.</i>	(12)
accuracy	The difference between the forecasted value and the actual value (forecast accuracy).	(16)
accuracy range	An expression of an estimate's predicted closeness to final actual costs or time. Typically expressed as high/low percentages by which actual results will be over and under the estimate along with the confidence interval these percentages represent. <i>See also: Confidence Interval; Range.</i>	(1) Dec 2011
activity	A component of work performed during the course of a project.	(17)
activity duration	The time in calendar units between the start and finish of a schedule activity.	(17)
actual cost	Total costs actually incurred and recorded in accomplishing work performed during a given time period for a <i>schedule activity</i> or <i>work breakdown structure component</i> . Actual cost can sometimes be direct labor hours alone, direct costs alone, or all costs including indirect costs. Also referred to as the actual cost of work performed (ACWP).	(18)

"Acts of God" aka <i>act of nature</i>	Inevitable, unpredictable, and unreasonably severe event caused by natural forces without any human interference, and over which an insured party has no control, such as an earthquake, flood, hurricane, lightning, snowstorm. Acts of God are insurable accidents and valid excuses for non-performance of a contract. See Force Majeure .	(2)
advance elicitation interviews AEI	Risk Elicitation interviews that are held in advance of an upcoming risk assessment workshop (CRA/CEVP).	
allowance	Additional resources included in an estimate to cover the cost of known but undefined requirements for an activity or work item. Allowance is a base cost item.	(22)
alternatives vs options	When making a selection, you decide between alternatives . When holding an option , you defer the selection between alternatives to a later date. <i>Note: Options have value.</i>	(14)
analogy	A resemblance of situations... A forecaster can think of how similar situations turned out when making a forecast for a given situation.	(16)
anchoring bias aka <i>focalism</i>	A cognitive bias where an individual relies too heavily on an initial piece of information offered (considered to be the "anchor") when making decisions.	(17)
	The tendency of a person's estimates (or forecasts) to be influenced when they start with a "convenient" estimate in making their forecasts. This initial estimate (or anchor) can be based on tradition, previous history, or available data.	(16)
	An unconscious reverence for the first piece of information presented, even if it is inaccurate or becomes obsolete. This gravitational or limiting influence on judgement and imagination can hamper attaining the best estimate or solution. <i>Sellers exploit this by posting a high asking price, expecting an offer at or above what they would settle for.</i> <i>To counter this bias, elicit the maximum value first, the minimum, and then the most likely value.</i>	
assess	To determine the importance, size, or value of (something).	(12)
assumptions	...factors that, for planning purposes, are considered to be true, real, or certain without proof or demonstration. <i>NOTE: assuming that a particular risk will not happen is not a valid assumption.</i>	(18)
alternative technical concept ATC	An ATC (in Design Build contracts) is a proposal that offers savings in time or cost during design and construction of the project, and ultimately to obtain the best value for the public.	
authority bias	The tendency to attribute greater accuracy to the opinion of an authority figure (unrelated to its content) and be more influenced by that opinion, believing their views to be more credible, and hence place greater emphasis on the authority figure's viewpoint. See cognitive bias <i>In a workshop setting, deference can subtly affect the team's thinking by dampening the inception of ideas that run contrary to or are critical of those stated or known to be held by the eminent person.</i> <i>It is best practice to exclude, if possible, one in authority that would tend to pressure the team to not exceed a favored number, or to not stray from a favored solution.</i>	(21)

availability heuristic The mind's tendency to readily recall memories of events that happened recently, or were extraordinary, combined with a subconscious inclination to inflate their significance; a bent to favor, revere and/or settle on those immediate thoughts and ideas. *See heuristic, cognitive bias.*

Because every project is unique, we should remind ourselves to spend a bit more time dredging our minds for experiences and knowledge that best serves the outcome.

B

base cost estimate A term in quantitative cost risk analysis that represents a reviewed and/or validated project cost estimate. The base cost represents the "reasonably expected" cost if the project materializes as planned, including PE, RW, and CN costs. The base cost estimate is unbiased and neutral; it is not optimistic or conservative. It does not anticipate any expense due to risk events, but does include the WSDOT standard construction contingency. Base costs reported to program management shall be in current-year dollars (uninflated estimate). *See WSDOT Plans Prep Manual 800.*

base cost estimate validation A detailed examination of the estimated costs for a particular project under consideration to assess validity, reasonableness, consistency and accuracy of these costs.

Review/validate estimates several times throughout project development

*For **quantitative project risk analysis**, the project costs are initially estimated by the Project Team and then reviewed/validated by independent cost experts prior to and/or during the cost risk workshop. The reviewed/validated estimate becomes the base cost estimate for analysis.*

base variability describes inherent variability, not caused by risk events. Base variability captures a modest symmetric range about the estimated value of the form: base value $\pm x\%$. Base variability represents ordinary quantity and price variations about the estimate base.

EXAMPLE: When filling a gas tank there is an idea of what it will cost. It is not certain until the purchase. Uncertainty exists with respect to cost per gallon and quantity. If the gas tank capacity is 20 gallons and the gas gauge indicates half a tank- that approximates the gas needed. The actual amount likely falls between 9 and 11 gallons, not precisely 10.0 gallons.

baseline The approved time-phased plan (for a project, a work breakdown structure component, a work package, or a schedule activity), plus or minus approved project scope, cost, schedule, and technical changes. Generally refers to the current baseline, but may refer to the original or some other baseline. Usually used with a modifier (e.g., cost baseline, schedule baseline, technical baseline, etc.) *See also Performance Measurement Baseline.* (17)

baseline cost estimate Cost projection performed early in a program or project to serve as the reference point for all subsequent tracking, comparing, and auditing. (2)

Basis of Design
BOD a document/template used to record information, decisions, and analyses needed in the development of a project design, including all factors leading to the development and selection of a project alternative, and the selection of design elements associated with that alternative.

Basis of Estimate
BOE *estimate basis and assumptions* Documentation to enable the agency to easily track changes to project scope, cost, and schedule. This document provides a trail about what is known about the project. This allows project "knowns" as well as "unknowns" to be clearly identified. This documentation is important because multiple estimators may be involved on the project; complex projects take years to develop, and estimates must be completed multiple times. (13)

conceptual estimating	or parametric estimating techniques are primarily used to support development of planning or early scoping phase estimates when minimal project definition is available. Statistical relationships or non-statistical ratios, or both, between historical data and other project parameters are used to calculate the cost of various items of work (i.e., center lane miles or square foot of bridge deck area).	(29) 1 st Ed.
confidence interval	The probability that a result will be within a range. <i>See also: Accuracy Range; Range.</i>	(1) Dec 2011
	An expression of uncertainty. The likelihood that the true value will be contained within a given interval. In forecasting the confidence, level refers to the uncertainty associated with the estimate of the parameter of a model while the prediction interval refers to the uncertainty of a forecast. <i>See Prediction Interval.</i>	(16)
configuration management	Administrative and technical actions taken to identify and document the functional characteristics (such as interface and layout of a system). It also includes: <ul style="list-style-type: none"> controlling and documenting changes made to the functional characteristics and layout recording model and vendor information on all discrete parts setting up and tracking maintenance and testing schedules. Also called configuration control. 	(2)
confirmation bias	the tendency to search for, interpret, favor, and recall information in a way that confirms or supports one's prior beliefs or values. People display this bias when they select information that supports their views, ignoring contrary information, or when they interpret ambiguous evidence as supporting their existing attitudes. The effect is strongest for desired outcomes, for emotionally charged issues, and for deeply entrenched beliefs. Confirmation bias cannot be eliminated entirely, but it can be managed, for example, by education and training in critical thinking skills. <i>See cognitive bias.</i>	(21)
consequence	Outcome of an event affecting objectives.	(10)
construction administration costs	The Base Costs of administration, management, reporting, design services in construction and community outreach etc. which are required in the construction phase .	
construction phase	That part of a project life cycle during which the construction work is carried out, also known as the implementation phase.	
construction contingency	Funds authorized at the time of contract award to be expended on unexpected, urgent, minor needs due to uncertainties in quantities, unit costs, and minor risk events that occur during construction.	
contingency	An 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. Typically estimated using statistical analysis or judgment based on past asset or project experience.	(1)
control	A measure that maintains and/or modifies risk. Controls include, but are not limited to, any process, policy, device, practice, or other conditions and/or actions which maintain and/or modify risk.	(10)

correlation	<p>A statistical measure of if and how much pairs of variables are related. It is indicated with a correlation coefficient, "r", that ranges from -1 to +1. The closer to +1 or -1, the stronger the linear relationship between two variables; 0 means there is no linear relationship. Positive r means correlation where the two variables increase or decrease in unison; negative r means a higher value in one variable accompanies a lower in the other. For example, temperature and the fluid in a thermometer; as it gets warmer, the fluid rises—a positive correlation.</p> <p><i>One should not assume a cause-and-effect relationship between variables solely on an observed correlation—correlation is not causation.</i></p>	
cost	<p>The expenses a contractor will incur in performing contract work.</p> <p>Cost + Profit = Price</p>	(1)
	<p>cost is the economic value of the human effort which is deployed to go, in a given environment, from situation A to situation B.</p>	(23)
cost-based estimating	<p>estimating considers seven basic elements: time, equipment, labor, subcontractor, material, overhead, and profit. Generally, a work statement and set of drawings or specifications are used to "take off" material quantities required for each discrete work task necessary to accomplish the project bid items. From these quantities, direct labor, materials, and equipment costs are calculated based on calculated or assumed production rates. Contractor overhead and profit are then added to this direct cost.</p>	(29) 1 st Ed.
cost engineering	<p>An area of engineering principles where engineering judgment and experience are used in the application of scientific principles and techniques to problems of cost estimation, cost control, business planning and management science.</p>	(3)
cost estimate	<p>compilation of all the probable costs of the elements of a project or effort included within an agreed upon scope.</p>	(1) May 2012
Cost Estimate Validation Process CEVP®	<p>An intense workshop where a team of top engineers and risk managers examine transportation project costs, schedules, and risks. The team is comprised of experts from private firms and public agencies, many with extensive first-hand experience with large project programming and delivery. It reviews project details with the owner (WSDOT engineers).</p> <p>The workshop team uses systematic project review and risk assessment methods to evaluate the quality of information. It identifies and describes risks. It estimates the impacts of risks in terms of cost, and schedule. The process offers the opportunity to reduce the number and/or impact of risks. It promotes activities to improve cost and schedule forecasting.</p> <p>See Cost Risk Assessment</p> <p><i>At WSDOT, the process is for projects over \$100M.</i></p>	
cost lead	<p>Leads the cost estimate review for a risk assessment workshop. Duties include leadership, facilitation, preparation, documentation; follow up, reconciliation of workshop results, technical report writing, process evaluation and communication. May participate in assessing new scenarios for the project.</p>	
cost of quality	<p>The costs incurred to ensure quality. These include: Prevention and appraisal costs (cost of conformance) include costs for quality planning, quality control (QC), and quality assurance to ensure compliance to requirements (i.e., training, QC systems, etc.). Failure costs (cost of non-conformance) include costs to rework products, components, or processes that are non-compliant, costs of warranty work and waste, and loss of reputation. See 1-10-100 Rule.</p>	(17)

Cost Risk Estimating and Management refers to programs or activities associated with risk-based estimating. “Cost” refers to resources; most commonly, money and time. CREM includes the framework, guidance, policy, structure, and support for **Cost Risk Assessment, CRA**. CREM often includes methods for integrating related or complementary processes such as project controls—particularly cost and schedule estimating, project management, quality management, constructability, and **value engineering**. *See also Cost Estimate Validation Process, CEVP.*

Critical Path Method A scheduling technique for projects with multiple stages and/or activities.

CPM

Cost Risk Assessment A workshop following the same methodology as CEVP® but use of extensive external subject matter expertise is somewhat relaxed. *See CEVP®*

CRA *WSDOT: CRA workshops are for projects between \$25M and \$100M.*

critical path A path connecting all activities, which have minimum or zero slack times. The critical path is the longest path through the network.

cumulative distribution function is a way to report the outcome distribution of stochastically modelled project cost and schedule forecasts (*See Monte Carlo simulation*). It is a graph with percent of simulated realizations, 0 to 100%, on the y-axis and outcome values, dollars or dates, on the x-axis. It is usually S-shaped when the uniform outcome **histogram** is monomodal, that is, having one hump. A point on the curve represents a confidence level, per the y-axis, that the actual project can be delivered at or below the x-axis value.

Current Year Dollars Today’s price; the estimated cost of the project if the project were built and completed in the analysis year, in present-day dollars.

CY

D

definitive serving to define, fixed or specific

deliverable Any unique and verifiable product, result or capability to perform a service that must be produced to complete a process, phase, or project. *See product, result, and service.* (17)

design phase The effort (budget/cost) of taking a project through the planning, scoping, and design phases. Planning and scoping typically have separate budgets encompassed under Design or Preliminary Engineering (PE). The terms “Design” or “Design Phase” are interchangeable.

design-bid-build means the traditional project delivery method where design and construction are sequential steps in the project development process. (30)
Title 23
636.103

DBB Often referred to as a project delivery method, where the owner (WSDOT) develops the project to 100% design level, and then solicits bids from contractors to construct the design.

design-build (contract) means an agreement that provides for design and construction of improvements by a contractor or private developer. (30)
Title 23
636.103

DB A project-delivery method to promote project innovation and efficiency and achieve critical schedule requirements. In this method, the owner (WSDOT) completes a preliminary design (to about the 30% level), and then solicits competitive proposals from teams consisting of construction contractors and their consultant designers, the Design-Builder. The owner executes a single contract with this one entity. The selected Design-Builder finishes the project’s design and completes all construction.

determine To fix conclusively or authoritatively (12)

deterministic Deterministic describes a definite... as opposed to ...probabilistic. (24)

distributions	A characteristic statistical pattern of occurrences of values for a particular outcome when repeated many times. In statistical modeling, values are generated within a defined range according to a particular distribution, thought to be representative of the value being modeled. Normal, uniform, beta, and negative exponential are examples of distributions. Each of these distributions has characteristic shapes when values are plotted against frequency of occurrence. For example, a normal distribution has a bell shape, exponential curves from horizontal to vertical, and uniform has a straight horizontal line.	(19)
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E

Earned Value Analysis	“Earned Value” is a project management technique. It measures what you got, for what you actually spent; the value of the work accomplished; the measured performance; the Budgeted Cost of Work Performed (BCWP).	
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economic indicators	Statistics or economic indices produced on an economy on a regular basis. They are important as barometers of economic activity and the state of the business cycle...	(8)
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80/20 Rule aka <i>Pareto's Law</i>	A statistical principle named after Italian economist Vilfredo Pareto, who observed that 80% of the wealth in Italy was controlled by 20% of the population. In cost management, it is commonly used to describe the situation where a small subset of cost items, activities, and so on, are the source of most of the total cost, duration, etc.	(1) Dec 2011
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elicit	To draw forth...; To bring out... <i>from</i> the data in which they are implied. To extract, draw out (information) <i>from</i> a person...	(15)
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elicitation	The action of eliciting or drawing forth.	(15)
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engineer's estimate	The term is frequently used to mean the estimate at time of bid, but also used by some to mean any estimate done during the Preliminary Engineering phase. <i>See WSDOT Plans Prep Manual Division 8, "Contract Estimate".</i>	
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escalation	The total annual rate of increase in cost of the work or its sub-elements. The escalation rate includes the effects of inflation plus market conditions and other similar factors. <i>See inflation.</i>	(5)
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a persistent rise in the price of specific commodities, goods, or services due to a combination of inflation, supply/demand, and other effects such as environmental and engineering changes. (25)

estimate	A quantitative assessment of the likely amount or outcome. Usually applied to project costs, resources, effort, and durations and is usually preceded by a modifier (e.g., preliminary estimate, conceptual estimate, etc.). An estimate is expressed as a range; it offers an indication of accuracy (i.e., $\pm x$ percent).	(17)
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A project estimate is actually comprised of two components: the base cost estimate component and the risk/uncertainty component.

estimate at completion EAC	The expected total cost of a project when the defined scope of work will be completed.	(17)
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estimate to complete ETC	The expected cost needed to complete all the remaining work for a... project.	(17)
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event	Occurrence or change of a particular set of circumstances.	(10)
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expected value	Probability × Impact = EV	
EV	The best estimate of what should happen on average (that is, the mean outcome for cost, activity duration, and so on. The expected value for a probability distribution function is calculated by multiplying all possible values by their probabilities.	(19)

One method of prioritizing risks is to calculate EV for each and then rank by EV. Risks with higher probability and impact will rank higher.

expert judgment	Judgment provided based upon expertise in an application area, knowledge area, discipline, industry, etc. as appropriate for the activity being performed. Such expertise may be provided by any group or person with specialized education, knowledge, skill experience, or training, and is available from many sources including: other units within the performing organization; consultants; stakeholders; including customers; professional and technical associations; and industry groups.	(17)
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F

FHWA	Federal Highway Administration - division of USDOT that funds highway planning & programs.	
flowcharting	The depiction in a diagram format of the inputs, process actions, and outputs of one or more processes within a system.	(17)
FOB	"Freight on Board"; indicates where the seller's responsibility ends and the buyer's begins regarding shipment of the materials.	

force majeure risks	Low-probability risks with a high impact on the project, usually arising from causes outside the project's sphere of influence – for example: catastrophic environmental conditions, disturbance of normal working conditions or prevention or suspension of operations. Force majeure risks are difficult to manage within a project and are often escalated to a higher level.	(19)
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Standard clause found in construction and supply contracts, it exempts the contracting parties from fulfilling their contractual obligations for causes that could not be anticipated and/or are beyond their control. These causes usually include act of God, act of man, act of parliament, and other impersonal events or occurrences. French for "superior force". Also called "irresistible force". See "**Acts of God**".

forecasts	Estimates or predictions of conditions and events in the project's future based on information and knowledge available at the time of the forecast.	(17)
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framing effect	A cognitive bias where decisions are influenced by the way information is presented, consciously or not, by the presenter. Depending on what features are highlighted, an inferior option may gain preference over one that is more optimal. <i>Team members should strive to be neutral when presenting ideas and to consider this effect when receiving information or ideas.</i>	
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frequency distribution	For discrete output distributions, a chart plotting values along the x-axis and the probability of occurrence for each value along the y-axis. For continuous output distributions, a histogram in which the x-axis is divided into a large number of "bins" of equal size and the y-axis shows the probability of occurrence of a value within any given bin.	(31)
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future costs	Costs that are escalated by projected inflation rates to specific points in time, consistent with a particular project schedule.	
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G

goal	The end toward which effort is directed: <u>aim</u>	
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H

heuristic	An experience-based technique used as a general way of solving a problem, e.g., Rule of Thumb.	(1) Dec 2011
	Any approach to problem solving or self-discovery that employs a practical method, not guaranteed to be optimal, perfect, or rational, but instead sufficient for reaching an immediate goal.	(21)
	Heuristics are mental shortcuts that ease the cognitive load of making a decision. Examples include an educated guess, an intuitive judgment, a guesstimate, profiling, or common sense.	
	<i>This is a person's immediate, instinctive, default, problem solving or decision-making method. Sole reliance on heuristics in a unique, project assessment/analysis setting may lead to errors such as failure to identify a risk, or to inaccurately determine its likelihood and/or impact, and/or to settling on a solution that has always worked in the past but may not be optimal in this case.</i>	

See **availability heuristic; cognitive bias**

histogram	A graphical summary of a numerical dataset using rectangles, with width representing an interval or value range group, and height relative to quantity of samples within the group interval. It conveys an idea of spread and concentration—distribution—of dataset values. See frequency distribution .	
historical information	Documents and data on prior projects including project files, records, correspondence, closed contracts, and closed projects.	(17)
human resource planning	The process of identifying and documenting project roles, responsibilities and reporting relationships, as well as creating the staffing management plan.	(17)

I

iatrogenic risk	<i>Iatrogenic</i> : induced inadvertently by a physician or surgeon or by medical treatment or diagnostic procedures.	(12)
	In a risk analysis, an understatement (or overstatement) of true risk caused by faulty risk analysis practices including, but not limited to: failing to identify significant threats risks and/or opportunities, assigning probability density functions to too many elements in a Monte Carlo Analysis or range estimate, incorrectly assuming independence between input elements for risk analysis simulations, and failing to adequately quantify the ranges of input elements. See secondary risk .	(1) Dec 2011
impact	The effect on the project objectives if a risk event should occur.	(19)
inflation	A persistent tendency for prices and money wages to increase; measured by the proportional changes over time in some appropriate price index...	(4)
	A persistent tendency for nominal prices to increase. Inflation is measured by the proportional changes over time...	(15)
	An increase in the volume of money and credit relative to available goods and services resulting in a continuing rise in the general price level.	(12)
	<i>The effect of inflation is loss of purchasing power over time.</i>	

J

job	A piece of work; <i>especially</i> : a small miscellaneous piece of work undertaken on order at a stated rate	(12)
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K

knowledge	An understanding of something or a process with the familiarity gained through experience, education, observation or investigation, it is understanding a process, practice or technique, or how to use a tool. (17)
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L

Lean	A methodology that incorporates tools and techniques designed to maximize customer value, while reducing waste along the entire value stream. It also focuses on improving overall efficiency, quality, and customer satisfaction.
lessons learned	The learning gained from the process of performing the project. Lessons learned may be identified at any point. Also considered a project record to be included in the lessons learned knowledge base. (17)
likelihood	Chance of something happening. (10)
lookout list	a list of minor risks or issues identified during project risk assessment that were not deemed of concern to include in further analysis or modeling yet are recorded for project team awareness. In some instances, the list or select entries are included for modeling, with aggregated probability and impact.

M

magnitude	The expected value of consequence associated with an event.
market conditions	<p>The consequence of supply and demand factors which determine prices and quantities in a market economy; separate from inflation. Market conditions include the bidding environment; the labor market; resource availability, etc.</p> <p>Influences include: "availability of skilled labor"; "supply of steel is low because of high demand in multiple markets causing a temporary upswing in steel prices"; "the number of bidders is expected to be low therefore competition is reduced"; "the type, size, and/or 'packaging' of the work is anticipated to influence bids and/or the number of bidders"; "influences of timing of advertisement on bidders and their responses".</p> <p>Market characteristics such as number of competitors, level of intensity of competitiveness... (26)</p> <p>economic environment for business (27)</p>

Example of how market conditions are captured in WSDOT's modeling tool for probabilistic risk-based estimating:

Market Conditions		
	Probability	Impact
Favorable:	10%	10%
Unfavorable:	20%	20%

Master Deliverables List MDL	A comprehensive listing of project elements intended as a starting point for the creation of work breakdown structures (WBS) for projects. The Master Deliverables List is organized in project phases to the deliverables level.
Measures of Effectiveness MOE	Measures or tests, which reflect the degree of attainment of particular objectives. MOEs are used to compare competing alternatives. MOEs are sometimes called performance measures.

1-10-100 Rule	A quality management concept developed by G. Loabovitz and Y. Chang (1992) that is used to quantify the hidden costs of poor quality. Essentially, risk management or QA/QC activities cost exponentially less than remediation, which costs exponentially less than failure; somewhat after Benjamin Franklin’s ounce of prevention being worth a pound of cure. <i>See cost of quality.</i>
opportunity	Uncertainty that can positively affect project objectives (positive event risk). Examples include strategies to reduce cost or durations, beneficial funding decisions, improved revenue projections etc.
optimism bias	A state of mind that causes the respondent to forecast that favorable events are more likely to occur than is justified by the facts. We think we are more likely to experience positive than negative events. (16) <p>“...unrealistic optimism can lead to risky behavior, to financial collapse, to faulty planning. The British government, for example, has acknowledged that the optimism bias can make individuals more likely to underestimate the costs and durations of projects. So, they have adjusted the 2012 Olympic budget for the optimism bias.” Tali Sharot, TED2012</p> <p><i>This tendency may interfere with one’s perception and assessment of threats, while enhancing the number, likelihood, and value of opportunities.</i></p>

P

parametric estimating	<i>See conceptual estimating.</i>
Participation Matrix	A spreadsheet to plan the attendance and timing of workshop participants.
percentiles from Monte Carlo simulation results range	The Percentile of the Year of Expenditure from a Monte Carlo simulation indicates that the dollar amount of “x-percentile” will not exceed that amount. For example: the 60th percentile on a project is \$110M. This means there is a 60% probability the project will be delivered for \$110M or less.
performance measurement baseline	An approved integrated scope-schedule-cost plan for the project work against which project execution is compared to measure and manage performance. Technical and quality parameters may also be included. <i>See also configuration management. See Baseline.</i> (17)
post-response risk	The risk <i>after</i> a response is determined and actions are taken to enhance opportunities and reduce threats to the project’s objectives. The response action identifies and assigns parties to take responsibility for each risk response. Risks are known as “pre-response” if no response action has yet been determined.
Practical Design/ Practical Solutions	A performance-based approach to making project decisions that focuses on the specific problem the project is intended to address. It looks for lower cost solutions that meet outcomes that partnering agencies, communities, and stakeholders have identified. With practical solutions, decision-making focuses on maximum benefit to the system, rather than maximum benefit to the project. Focusing on the specific project need minimizes the scope of work for each project so that system-wide needs can be optimized. Practical design is a fundamental component to the vision, mission, values, goals, and reforms identified in Results WSDOT- WSDOT’s Strategic Plan .

It is important to address the core purpose and need for the project and to inform decision-makers regarding possible impacts to other objectives (such as system safety and operational performance, context sensitivity, life-cycle costs, long-range corridor goals, all travel modes, livability, and sustainability).

prediction interval	The bounds within which future observed values are expected to fall, given a specified level of confidence. For example, a 90% prediction interval is expected to contain the actual forecast 90% of the time. However, estimated prediction intervals are typically too narrow for quantitative and judgmental forecasting methods.	(16)
pre-response risk	An identified risk <i>before</i> a response is determined and actions are taken to enhance opportunities and reduce threats to the project's objectives.	
price	The financial outlay made to pay for a product or service. Price = Cost + Profit	(1)
proactive risk response	An action or set of actions to reduce the probability or impact of a threat (or delay its occurrence) or increase the probability or impact of an opportunity (or bring forward its occurrence). Proactive risk responses, if approved, are carried out in advance of the occurrence of the risk. They are funded from the project budget.	(19)
probabilistic risk-based estimating PRBE	is the risk-based estimating technique that combines a project base cost estimate and project risk assessment information, such as impact and probability, in a simulation model to forecast a range of values for project cost and schedule. <i>See Monte Carlo analysis, etc.</i>	(29) 1 st Ed.
probability	An estimate of the likelihood that a particular risk event will occur, usually expressed on a scale of 0 to 1 or 0 to 100 percent. In a project context, estimates of probability are often subjective, as the combination of tasks, people and other circumstances is usually unique. "Probability – is degree of certainty and differs from absolute certainty as the part differs from the whole." <small>Jacob Bernoulli / Leibniz, "Against the Gods – the Remarkable Story of Risk", p123, Peter L. Bernstein</small>	(19)
probable cost of risk events	Costs associated with risk events, typically with substantial variability.	
product	An artifact that is produced, is quantifiable, and can be either an end item in itself or a component item.	(17)
profit	In a broad sense business profit is whatever monies are left after all costs have been paid. When talking about a particular contract, profit is the additional amount a contractor receives above out-of-pocket costs; profit makes it worthwhile to do the particular contract work. It is the reward for undertaking the contract task in the first place. Price = Cost + Profit	(1)
program	A group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually.	(17)
programming	For many states the project programming process is governed by statute. State transportation funds must be invested based on a policy of priority programming. Priority programming is the rational selection of projects and services according to factual need and an evaluation of life cycle costs and benefits. Projects are to be systematically scheduled to carry out defined objectives within available revenue.	
project	A <u>temporary</u> endeavor undertaken to create a <u>unique</u> product or service. <i>Projects are distinct from "operations," which are usually ongoing and repetitive activities.</i>	(18)
project manager	Any person assigned to lead a team toward completion of a project . A project manager applies specialized knowledge, skills, tools, and techniques in order to meet defined goals and customer expectations for a project .	

project objectives	A statement of specific and measurable aims by which the degree of success of the project will be assessed.	(19)
project schedule	The Schedule as presented by the Project Team, corresponding to the Project Team Estimate.	
project team	The Team representing the particular project under consideration.	
prospectus	Description of a project.	
PSE or PS&E	Plans Specifications and Estimate. This is the set of contract plans with specifications and the design engineer's estimate for a project.	

Q

quality	The degree to which a set of inherent characteristics fulfills requirements.	(17)
quality assurance QA	Refers to those actions, procedures, and methods to be employed at management levels, under the jurisdiction of the Project Engineer (or Quality Manager), to observe and ensure prudent quality control procedures are in place and are being carried out, and the desired results of quality professional services are being achieved in accordance with the Quality Management Plan.	
quality control QC	Refers to those actions, procedures, and methods that are to be routinely employed at the production and administrative levels, under the jurisdiction of the Project Engineer, during the development of work products to produce the desired quality professional services.	
quality verification QV	Refers to those actions, procedures and methods employed at HQ Project Development, under the jurisdiction of the State Design Engineer or designee, to selectively review final products to ensure a Quality Management Plan was implemented, the appropriate project development process was followed, and was reflected in the final contract document.	
qualitative QL assessment/analysis	An assessment of risk relating to the qualities and subjective elements of the risk – those that cannot be quantified accurately. Qualitative techniques include defining the risk and recording the details and relationships, and the categorization and prioritization of risks relative to each other. <i>Identifying risk triggers should be done as well. Risk identification and description often involves consultation with subject matter experts for each project activity.</i>	(19)
quantitative QT assessment/analysis	Modeling of numerical outcomes by combining actual or estimated values with an assumed or known relationship between values, using arithmetic or statistical techniques, to determine a range of likely outcomes of a variable or to understand how variance in one or more values is likely to affect others. Quantitative techniques include defining the risk, recording the details and relationships, as well as noting risk triggers. The probability of occurrence and impact range of each risk is determined. Quantitative analysis often involves consultation with subject matter experts for each project activity. <i>See Probabilistic Risk-Based Estimating, Monte Carlo analysis, etc.</i>	(19)

R

range	The absolute difference between the maximum and minimum (or some stated confidence interval) values in a set of values; the simplest measure of the dispersion of a distribution. <i>See also: Accuracy Range.</i>	(1) Dec 2011
range cost estimate	A cost estimate that gives a range of costs, related to specific confidence levels.	

range estimating	(1) A formalized risk analysis technology that synergistically combines Pareto's law (80/20 Rule) to identify the relatively few critical elements, heuristics governing the assignment of probabilistic ranges to such elements, and Monte Carlo Simulation to provide decision making information quickly and at reasonable effort. (2) A generic term variously used to define: a) estimating a variable in the form of a probabilistic range ; b) application of Monte Carlo Simulation based on a set of probabilistic ranges applied to model variables; c) a synonym for stochastic or probabilistic estimating.	(1) Dec 2011
residual risk	The risk that remains after risk responses have been implemented.	(17) 6 th Ed.
result	An output from performing project management processes and activities. Results include outcomes (e.g., integrated systems, revised processes, training personnel, etc.) and documents (reports, policies, plans, studies, etc.)	(17)
Right-Of-Way (RW) Phase	One of three major project phases affecting cost and schedule; along with Preliminary Engineering, PE; and Construction, CN. If required for the project, RW Phase activities involve identification and purchase of property or property rights including leases, permits, and easements necessary for construction activities, slopes, drainage, maintenance, etc. whether temporary or permanent. Beside those typical when dealing with property owners, risk concerns stem from interdependencies with other phases and activities which, if misaligned, may add cost or delay. Examples include, environmental permitting required before real estate purchase, and real estate purchase required before actual construction.	
risk	The effect of uncertainty on objectives. note 1: an effect is a deviation from the expected. it can be positive, negative or both, and can address, create, or result in opportunities and threats. note 2: objectives can have different aspects & categories; can be applied at different levels. note 3: risk is usually expressed in terms of <i>risk sources</i> (3.4), <i>potential events</i> (3.5), their <i>consequences</i> (3.6) and their <i>likelihood</i> (3.7).	(10)
risk analysis	A risk management process step (part of risk assessment) and methodology for qualitatively and/or quantitatively screening, evaluating and otherwise analyzing risks to support risk treatment and control. <i>See also: Risk Management.</i>	(1) Dec 2011
risk appetite	The degree of uncertainty an organization or individual is willing to accept in anticipation of reward. <i>See risk tolerance.</i>	(17) 6 th Ed.
risk assessment	The overall process of identifying, describing and analyzing risks. Its purpose is to develop agreed priorities for identified risks. Some interchange the term assessment with analysis or evaluation.	
risk-based estimating RBE	A cost estimating technique that combines (1) traditional estimating methods for known items and quantities with (2) risk analysis techniques to estimate uncertain items, uncertain quantities, (uncertain costs), and risk events. <i>See probabilistic risk-based estimating.</i>	(29) 1 st Ed.
risk events	Uncertain events that affect a defined project with impacts to cost, schedule, safety, performance or other characteristics. Risk events do not include minor variance inherent in Base Costs.	
risk identification	Process of identifying, characterizing and quantifying potential risk events.	

risk lead	<p>The risk lead(s) participate in a peer-level review or due diligence analysis on the scope, schedule and cost estimate for various projects to evaluate quality and completeness, including anticipated risk and uncertainty in the projected cost and schedule. The risk lead:</p> <ul style="list-style-type: none"> • Leads the risk portion of the process including risk elicitation and project flowchart development for modeling. • Participates in cost validation or review and risk uncertainty workshops for selected projects. • Conducts prep sessions, follow-up meetings, and/or rerun sessions as necessary. • Provides reports and presentations documenting workshops. • Provides reports using report guide/table of contents. • Develops or implements workshops on topics such as project definition, and risk identification and management. 	
risk management	<p>Refers to the culture, processes, and structures that are directed toward effective management of risks – including potential opportunities and adverse effects.</p> <p>Risk Management Process – systematic application of management policies, processes, and procedures to the tasks of establishing the context, identifying, analyzing, assessing, treating, monitoring, controlling, and communicating risk.</p>	(20)
risk mitigation	<p>Establishes and implements management responses for dealing with risks in ways appropriate to the significance of the risk, benefit-cost of the responses and importance of the project.</p>	(20)
risk owner	<p>Person or entity with the accountability and authority to manage a risk.</p>	(10)
risk profile	<p>Description of any set of risks.</p>	(10)
Risk Register	<p>The risk register serves as a repository for identified project risks. It includes detailed information about the risk and is a “living” document that evolves as the project evolves. It typically records information such as: risk ID #, status of risk, risk categories, risk name, cause of the risk, effect of the risk, risk trigger, likelihood of risk occurrence, impact if risk does occur, response actions, and notes.</p> <p>It serves as a project management and communication tool to aide decision-makers and facilitates risk analysis.</p>	
risk reserve	<p>A reserve account to cover uncertainty and risk during project execution.</p>	
risk response	<p>The process of identifying and implementing actions to enhance opportunities and reduce threats. The risk response assigns parties to take ownership and is accountable for the response actions.</p> <p>Threat responses: Avoid, Mitigate (reduce), Transfer, Accept (retain) Opportunity responses: Exploit, Enhance (increase), Share, Accept (retain)</p>	
risk team	<p>Those CEVP® or CRA Team members plus Project Team members who focus on Risk for the particular project under consideration.</p>	
risk tolerance	<p>defines the boundaries within which the firm is comfortable operating given its overall risk appetite.</p>	– Logicgate.com

A person with a high-risk tolerance may not recognize a risk or not assess its likelihood and or impact as high as it may actually be, whereas one with low tolerance may clutter and dwell on risks of low significance.

risk trigger	A measurable or observable event or condition that is a precursor to or indicator of a risk's occurrence. An event or condition that causes a risk to occur. A trigger is a root cause of a risk event.	(1)
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S

scenario	A sequence of events especially when imagined; <i>especially</i> : an account or synopsis of a possible course of action or events	(12)
scope	The sum of the products, services, and results to be provided as a project.	(17) 6 th Ed.
scope creep	The uncontrolled expansion to product or project scope without adjustments to time, cost, and resources.	(17) 6 th Ed.
Scope Management Plan	A component of the project or program management plan that describes how the scope will be defined, developed, monitored, controlled, and validated.	(17) 6 th Ed.
scope of work SOW	Defines the work and activities necessary to deliver a project. Establishes context and boundaries for the work.	
Secondary risk	A risk that arises as a direct result of implementing a risk response. <i>See iatrogenic risk.</i>	(17) 6 th Ed.
sensitivity analysis	An analysis technique to determine which individual project risks or other sources of uncertainty have the most potential impact on project outcomes, by correlating variations in project outcomes with variations in elements of a quantitative risk analysis model. <i>See tornado diagram.</i>	(17) 6 th Ed.
service	Useful work... that does not produce a tangible product or result, such as the performing of business functions supporting production or distribution.	(17)
SMART	Specific, Measurable, Attributable, Relevant, Timebound—qualities of a good risk description.	
speculative	Of the nature of, based upon, characterized by, speculation or theory in contrast to practical or positive knowledge. ...based on conjecture rather than knowledge	(15) lexico.com
stochastic	refers to the property of being well described by a random probability distribution. Although stochasticity and randomness are distinct in that the former refers to a modeling approach and the latter refers to phenomena themselves, these two terms are often used synonymously. <i>See Monte Carlo method.</i>	(21)

T

team	Two or more people working interdependently toward a common goal and a shared reward.	
team building	A collective term for various types of activities used to enhance social relations and define roles within teams, often involving collaborative tasks.	(21)
team management	The ability of an individual or an organization to administer and coordinate a group of individuals to perform a task. Team management involves teamwork, communication, objective setting and performance appraisals.	(21)
threat	An event risk that has the potential to negatively impact project objectives.	
tolerance	total allowable amount by which a measurement may vary. It is the difference between the maximum and minimum limits.	(28)

tornado diagram	a special type of bar chart, where the data categories are listed vertically instead of the standard horizontal presentation, and the categories are ordered so that the largest bar appears at the top of the chart, the second largest appears second from the top, and so on.	(21)
	A display of sensitivity analysis which presents the calculated correlation coefficient for each element of the quantitative risk analysis model that can influence the project outcome... ...Items are ordered by descending strength of correlation, giving the typical tornado appearance.	(17) 6 th Ed.

transportation management	A concept that includes the use of TDM and TSM techniques in order to lessen traffic impacts of development and encourage private sector improvement to accommodate traffic growth. Sometimes referred to as traffic mitigation.
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transportation planning	A process to determine which transportation projects should be funded and delivered. It involves: understanding types of decisions to be made; assessing opportunities/limitations of the future; identifying consequences of alternatives; relating alternatives to goals and objectives; presenting information to decision-makers.
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U

ultimate cost	Actual cost at completion of all work elements, including all outside costs, changes and resolution of risk and opportunity events.
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ultimate schedule	Actual schedule at completion of all work elements, including all outside costs, changes and resolution of risk and opportunity events.
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uncertain	1: <u>INDEFINITE, INDETERMINATE</u> <the time of departure is <i>uncertain</i> > 5: not constant : <u>VARIABLE</u>	(12)
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uncertainty	The lack of knowledge of the outcome for a particular element or value.
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1: the quality or state of being <u>UNCERTAIN</u> : <u>DOUBT</u>	(12)
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the state of not being known or perfectly clear; doubtfulness or vagueness. ^{2a}	(15)
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Uncertainty reflects the state of mind about an unknown value and the probability that it will occur; it is based on information, evidence, and judgment.

USDOT	United States Department of Transportation – principal direct federal funding and regulating agency for transportation facilities and programs. Contains FHWA and FTA, FRA and other agencies.
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V

validation	A process to confirm the reasonableness, accuracy and completeness of estimated costs and quantities.
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value engineering VE	aka Value Methodology (VM) – A systematic process used by a multidisciplinary team, led by a qualified VM facilitator, to improve the value of a project, product, process, service or organization through the analysis of functions.
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variability	the fact of, or capacity for, varying in amount, magnitude, or value. ^{2a}	(15)
	Variability is an inherent state of things; it is applied to known outcomes of multiple instances based on data. Data comes from sample statistics, such as historic bid data.	

variance	Inherent fluctuations due to random events that result in a range of potential values for a quantity.
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Value Engineering Change Proposals	Are post-award value engineering (VE) proposals made by construction contractors during the course of construction under a VE clause in the contract.	(6)
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VECP	A construction contract change proposal submitted by the construction contractor based on a VECP provision in the contract. These proposals may improve the project's performance, value and/or quality, lower construction costs, or shorten the delivery time, while considering their impacts on the project's overall life-cycle cost and other applicable factors.	(30) Title 23 627.3(g)
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Value Engineering Risk Assessment	A workshop where both cost risk assessment and value engineering workshops are coordinated. Generally, a risk assessment/analysis is performed prior to the VE Study; results become input to the information phase of the VE study.	
VERA	The team proceeds through the remaining phases of the job plan with identifying responses to the risks in mind. After adoption of VE recommendations, a follow-up risk assessment is conducted to determine the effect on the initial risk assessment/analysis.	

W

Work breakdown structure	A hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables.	(17) 6 th Ed.
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WBS		
workshop	A usually brief, intensive educational program for a relatively small group of people that focuses especially on techniques and skills in a particular field.	(12)
	CRA/CEVP® workshops—a collaborative effort between the project team and subject matter experts to give a close and rigorous review of the estimated base cost and to identify and characterize the uncertainty and risk associated with the project.	
	An informal risk workshop is composed of the project team (or key project team members); the project manager/project team may include other participants as deemed necessary.	
		(WSDOT E 1053)

Y

year of expenditure	The estimated year that money will be spent to complete project work elements.	
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YOE		
YOE dollars	The estimated cost of the project when it is anticipated to be built. Typically, a forecast of the estimated YOE cost is determined by taking the estimate in current year dollars and inflating it to the anticipated midpoint of construction or activity.	(2)

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