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Including the estimator's leadership traits with your basis of capital cost estimate

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Abstract

Project controls artifacts like capital cost estimates, schedules, and risk registers can have an outsize influence on public agency owners to start or stop a project.

The basis of estimate typically explains the estimator's assumptions, reference documents and methodology. Existing standards, or procurement documents do not capture the cost estimator's leadership traits. Neither are leadership traits rated prior to selecting them, nor are they referenced along with the capital project's estimated cost, planned duration, or risk-based contingency.

The cost estimator's leadership traits can be rated by many factors like authenticity, empathy, influence, persuasion, psychological safety, vulnerability, trust, etc. They form a core part of their ability to debate, listen, analyze, include, and exclude while developing the project artifact, as an individual and in their teams. While these factors are intangible and difficult to quantify, they are a key input variable for planning-level comparison studies, iterative-design artifacts, order of magnitude deliverables, and machine learning applications.

In a 6-month leadership development program, the author examined his leadership journey as a cost estimator on a large capital construction program. The paper utilizes this experience and practitioner articles to suggest a narrow checklist to include with the basis of estimate document.

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Introduction

Project controls artifacts are a function of the information provided to the estimator or scheduler, respectively. Owners, and by extension, owner's representatives typically provide general terms and conditions, conformed design set, or any variation of these items that differ by procurement strategy, secondary contracting with architect/ engineering firm, and their historical templates to generate these project artifacts.

Capital cost estimates hold significant importance in the project stakeholder's decision-making process. Often, cost estimators do not have insight or control in the design development process and make assumptions as a person or as a team. These assumptions are based on firsthand experiences and historical knowledge. This paper does not discuss the need for leadership traits in developing operating and maintenance estimates, which depend further on facility engineering and lifecycle management costs.

Complementing the capital cost estimate, cost estimators provide a narrative or basis of estimate (BOE). This is a word document provided along with the deliverable forming an essential part of a professional submission. The development of BOE is typically not defined in proposal requirements from agency owners, or private owners.

The basis of estimate is defined by AACE [1] as," a document that describes how an estimate is prepared and defines the information used in support of development. The BOE commonly includes, but is not limited to, a description of the scope included, methodologies used, references and defining deliverables used, assumptions and exclusions made, clarifications, adjustments, and some indication of the level of uncertainty."

While, capital construction cost estimate development is well defined by various standards, including AACE International's RP 98R-18. They relate project scope development with cost estimate classification. For road and rail construction estimates, it provides relevant cost estimate classification aligning with project scope development. This classification clearly aligns a cost estimates primary and secondary characteristics, but does not relate leadership traits with a cost estimate class, like –

- Estimator's leadership qualities
- Estimating team's leadership metrics
- Commercial leadership assessments performed
- Related intangible traits

These intangible measures may provide a secondary characteristic in developing a capital cost estimate with higher probability of confidence.

Need for Leadership Traits in Capital Cost Estimate development

Project stakeholders depend on the BOE to understand various details of the cost estimate. The Total Cost Management Framework [2] states, "The basis of estimate is identified as a required component of a cost estimate. It is characterized as the one deliverable that defines the scope of the project and becomes the basis for change management."

Similarly, AACE Recommended Practice 34R-05 [3] suggests, "When prepared correctly, any person with capital project experience can use the BOE to understand and assess the estimate, independent of any other supporting documentation. A well-written BOE achieves those goals by clearly and concisely stating the purpose of the estimate being prepared, the project scope, pricing basis, allowances, assumptions, exclusions, cost risks and opportunities, and deviations from standard practices."

Typical procurement mechanisms provide no psychological safety that allow the cost estimator to question project stakeholder needs, the project scope development process, or provide alternatives while developing the cost

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model. They also do not mandate a process or steps that cost estimators must follow in full or part to provide consistent BOE.

Inherent to a cost estimating team, there are hierarchical structures, professional requirement, and inherent shortcomings that a cost estimating team, knowingly or unknowingly brings to the estimate. External variables like fees, time limits, and professional capacity feed into the development of a cost estimate as it progresses from Class 5 to Class 1, or up to an intermediate stage. These estimates not only face project constraints, but also estimate development constraints due to project delivery, market forces, and vendor management.

Estimating for Ill-defined scope

Public agency owners are moving away from lumpsum project delivery with 100% design development, towards Design-Build and similar progressive procurement contracts. In such scenarios, the cost estimator has access to limited project scope definition to develop the cost estimates and is dependent on developing assumptions, utilizing historical information within time constraints. The cost estimating team's judgement, previous insights, and experience with working on similar projects becomes a key intangible measure of the cost estimate.

The cost estimating environment may also not be suitable for the development of a detailed cost estimate or Class 1 estimates, and more appropriate for analogous or parametric estimates. The resulting mismatch between cost estimate development and key cost drivers leads to inappropriate use of contingency planning, allowances, and difficulty factors that may lead to wrong or incorrect project costs.

Estimating for uncertainty

Developing large construction projects comes with one significant and overlooked challenge – multiple stakeholders. Multiple stakeholders, unknown financing requirements and uncertainty in procurement leads to a variety of risks.

For capital programs, developing conceptual estimates or Class 5 cost estimates aligns with budget requirements. Based on procurement strategies, project stakeholders may develop multiple iterations in the 0-5% design development phase, or as late as 30% design development. These multiple iterations of the cost estimate may cause estimating bias, owner bias, scope mismatches, version control issues, and fatigue to creep into the cost estimate development process.

Uncertain project development is also a symptom of multiple – Approval partners, Funding partners, Engineering teams, and Consulting teams.

Capital programs may also go through risk assessments to develop an estimate contingency plan. While such contingency plans are based on sound mathematical models, they do not have the benefit of incorporating the estimator's leadership traits.

Estimating for next generation systems

Capital projects are increasingly utilizing proprietary systems and innovative technologies. These include advanced sensor technologies, driver-less rolling stock, cashless and automated systems. Along with soil, concrete and steel, such technical innovations and proprietary technology are significant cost drivers for capital project estimates.

Direct costs like power supply and distribution infrastructure, and indirect costs to design, test and integrate these technologies also form a key component of such cost estimates. Estimators may make assumptions on labor production rates, testing & commissioning, fees, and royalty due to limited information on these products, and unavailable historical information, thereby over- or under-estimating costs.

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Estimating in a limited skill-set environment

Industries are grappling with a shortage in skilled workforce. Construction industry is not far behind. As the quality and quantity of cost estimators that are available to form cost estimating teams dwindles, the quality of cost estimates may also suffer, especially for capital construction programs.

There may exist situations where the proposed team is not available to perform the cost-estimating task due to procurement delays, multiple commitments; and secondary staff are assigned to develop a large capital construction estimate.

Estimating across time-zones

Post-Covid, teams are continuing to maintain work from home policies. This has led to a reduction in in-person communication leading to gaps in knowledge transfer. Cost estimating teams working towards a deadline may be additionally affected by team members working in different time-zones.

Capital projects scope also includes specialty scope that is procured via sub-consultants or performed by distantly located estimators. It is common for teams to not co-exist and be in different time zones. This additional constraint may affect communication between teams during cost estimate development.

Estimating for a cost-sensitive client

Public owners are sensitive to their annual budgets and funding sources. This may be reflected in the Architect-Engineering fees, and overall project budgets. When the right budget is not available to cover development of appropriately classified estimates, it may affect stakeholder ability to take the right decisions. Owners may miss value engineering, periodic risk assessments, or end up utilizing information from a different market environment.

Similarly, projects budgets are a top concern. Many urban environments pose scope challenges that are captured as an allowance item or as an alternative scope. The development of such lump-sum costs depends on the cost estimator's skills and to an extent on their leadership traits.

Estimating quickly

Time is of the essence. Cost estimating teams plan well and are prudent with time management when developing the first iteration of the cost estimate. As the project moves towards intermediate phases of project scope development, it may create unique challenges for the team to update the estimate. This may be due to the functional nature of the estimating team, i.e., they do not have complete knowledge of start dates for cost estimate work, thereby leading to incremental issues, for example, if the take-offs are not properly referenced, key cost driver is not refreshed etc. Hence, "estimating quickly" poses a challenge to cost estimate development.

They may not fully estimate associated contingency costs, risk-based costs, and allowances, thereby over or underestimating costs for such scope of work.

Estimating, repeatedly

Capital cost estimates may be developed during multiple phases of the project. For typical project delivery methods, Class 3 or 4 cost estimates are prepared at budget approval stages, and an Independent Cost Estimate (ICE) or Class 2 cost estimate at bid stage. Additional cost estimates like sub-specialty estimates, diversity spend estimates, what-if estimates, value engineering studies, change order estimates etc. may be prepared during the project life cycle as well. This nature of repeated cost estimating may

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Leadership Traits in business applications

Psychological safety was coined in the late 1990s, when Edmonson, A. [4] defined it as "a shared belief held by members of a team that the team is safe for interpersonal risk taking". They found that the best teams are not the ones with the fewest errors, but the ones where errors could be re-framed as an individual or team learning experience.

This certainly should not be assumed as a "free-for-all" approach, especially with billable client work. Rather, as complex construction projects are planned, and no one cost estimator can estimate the whole project, the team should be assessed for leadership traits and built with psychological safety in mind. There are several leadership traits identified and researched in business, and this paper identifies a few that resonated with cost estimate development process.

Asking

In his paper, Batista [5] refers to different modes of inquiry, i.e., pure inquiry, diagnostic inquiry, and confrontational inquiry. He refers to starting and staying in the "pure inquiry" zone for a long time, with an open-ended line of questioning. Instead of starting a cost estimate review with pointed questions, it may help the reviewers to let the cost estimating team present their work thereby allowing them to lay a broad idea and present their story on how the cost estimate developed from quantities through unit rates with assumptions to a deterministic number. Pure inquiries can also provide your review process with a sense of psychological safety.

It will also guide the stakeholders towards an over-arching bias. These biases, true or not, may provide clues on the cost estimator's interpretation of market conditions, comparative work products, common vendor referenced information etc. Pure inquiry allows the cost estimators to provide an expanded narration of their thoughts. They are neither clearly referenced in the basis of estimate documents, nor well documented during the review process.

The next stages of inquiry - diagnostic inquiries are commonly utilized in cost estimating reviews, and involve asking questions specific to scope of work, specific unit rates, high-cost drivers, mark-ups, or contingency line items. Similarly, the third step is confrontational inquiries that allow for what-if questions, construction means and methods, and inquiries that may lead to value engineering studies.

It is imperative that all stakeholders focus on asking the questions, without imposing or guiding answers based on their experiences and authority. This may potentially cloud the cost estimators' responses. It may also lead the team to get pigeon-holed into a limited set of issues, missing other cost drivers and the larger estimating pain points.

Empathizing

Hougaard et al. [6] defines empathy as a close, visceral understanding of another person's experience. They feel "with" the person and mirror their feelings and emotions. Cost estimates, schedules, risk registers etc. for large complex projects reflect takeaways by a third party, i.e., a consultant, task-focused vendor, project controls firm etc. They will differ from ownership stakeholders' assumptions, and AEC firms. In such instances, empathy is required to carefully understand the differences, before jumping to conclusions. It forms the basis to understand why a cost estimator has a different opinion of a scope or task than oneself.

Conflict resolution

Cost estimators work in a team. That team may be formed of project managers, engineers, inspectors, owners, contractors, vendors, and other stakeholders. Project stakeholders may have a secondary or tertiary relationship with the cost estimator during a change order estimate process as well. There is a lot of potential for conflict during estimate development, negotiations, and during presentation. Kenitz [7] mentions that "Today's employees reportedly spend 2.8 hours a week dealing with workplace conflict."

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Similarly, Gallo [8] explains, “people are complicated”. They further expand on this complexity by categorizing conflict into four types, explained in Table 1 below.

Table 1: Various categories of conflicts described by Gallo [8] , aligned with cost estimate development process.

Description [8]	Explanation
Process Conflicts: They arise from differences over how best to proceed	• Commonly experienced when procuring projects with limited scope definition. • Can be captured or referenced at various stages of procurement or estimate development. • Can affect contingency and contractor overheads if scope issues creep into unit rate development.
Task Conflicts: They relate to a project’s goals, or the reason for performing a task	• Experienced when team is not engaged on a well-defined cycle, and when comparing between estimates developed at progressive design stages. • Can be captured or referenced as estimate development progresses. • Can inflate or deflate total project costs if cost estimates are developed with time or fee constraints.
Status Conflicts: They occur when one butts heads with the person in charge	• Can be experienced within the cost estimating team, but intangible to quantify. • Can affect unit rate development, and other cost estimating components.
Relationship Conflicts: They crop up when feelings get personal	• Can be experienced within the cost estimating team or with external teams, but intangible to quantify. • Can be highlighted or lightly referred to alongside assumptions, inclusions, and exclusions. • Can affect unit rate development, and other cost estimating components.

Active Listening

A project owner needs to communicate that they are interested, care and are actively listening to their cost estimator, or the estimator may find no value in sharing information. This loss in sharing pertinent information can lead to missed opportunities and failed procurement. Active listening is not only key external to estimating teams, but also internal to the whole project controls team – schedulers, estimators, cost analysts, document controls, risk, contracts, and procurement.

Active listening has three typical aspects: Cognitive, Emotional, and Behavioral response. Abrahams, et al. [9], defines cognitive response, as “Paying attention to all the information, both explicit and implicit, that you are receiving from the other person, comprehending, and integrating that information.” In cost estimating teams, this becomes a big challenge with competing priorities, time constraints, ongoing scope development, and spread-out team members. There are high chances of information misplaced, missed, miscategorized, or misidentified due to multiple reasons –

- Email, undocumented or improperly documented information
- Information conveyed by multiple channels – MS Teams, Emails, Office messaging, Drawings, Specifications etc.
- Ongoing technical updates to drawings & specification books
- Version controls within the team

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The author [9] defines emotional response, as "Staying calm and compassionate during the conversation, including managing any emotional reactions (annoyance, boredom) you might experience.", and, behavioral response, as "Conveying interest and comprehension verbally and nonverbally." These responses are critical both for inter-team and intra-team communications.

Inter-team estimators typically opine on difficulty of work, scope delineation, and mark-up rates. Intra-team, it is critical for project controls teams to utilize singular set of assumptions and information for standardized work product, and in accurately reporting project health during various project phases. There are many tools available to the estimator to emphasize active listening for their audience, some of them including –

- Repeating the last few words
- Providing, acknowledging, and reading non-verbal cues
- Minimizing distractions

Influence

The ability of the project controls leader to persuade or influence a team is paramount in developing a project deliverable. Influencing external stakeholders may also be the difference between winning a proposal and losing it. In daily construction life, influencing team members is an important trait for the leader, manager, and executive to shepherd their teams to a successful project.

Cialdini [10] states that this art of influencing has a science to it. He identified six principles of persuasion, which seem relevant to winning, developing, and presenting the cost estimate to internal and external stakeholders. These principles are tabulated in Table 2 below, along with their definition, application, and an interpreted generic example for the project controls industry.

Table 2: Six Principles of Persuasion *[10]*, with relevant cost estimating examples

Principles [10]	Definition [10]	Application [10]	Cost Estimating example
Liking	People like those who like them	Uncover real similarities and offer genuine praise	Helpful in building cost estimating teams that can trust each other.
Reciprocity	People repay in kind	Give what you want to receive	Align cost estimate reviews with other attributes, for example – cost estimate classification.
Social Proof	People follow the lead of similar others	Use peer power whenever its available	Siloed teams may not perform at an elevated level, compared to centrally merged project controls teams.
Consistency	People align with their clear commitments	Make their commitments active, public, and voluntary	Clarify the descriptions in detail, whenever possible
Authority	People defer to experts	Expose your expertise, do not assume its self-evident	Transparently perform cost estimates, and review submissions with individual team members.
Scarcity	People want more of what they can have less of	Highlight unique benefits and exclusive information	Focus on key cost drivers

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One may influence widely by improving your network. To succeed in project controls functions, a cost estimator is dependent on their network of - vendors, colleagues, engineering prime companies, and other professionals. The author [11] explains these networks to accomplish routine tasks, to help with personal advancement, and to reach key organizational objectives, respectively. They further explain your networks may be further combined into three types of networks – Operational, Personal, and Strategic networks.

Coaching

Construction is a team effort, and construction teams may include administrative personnel, engineers, lawyers, and folks with widely diverse backgrounds. With such a wide variety of team members, there is no dearth of coaches and coaching, yet cost estimating teams do not identify such resources in their basis of estimate documents. While peer coaching is different from executive coaching, or one-on-one coaching, it provides multiple benefits. It allows learning on the job, from folks who have a keen understanding of the industry and can communicate actions and expectations in a simple, easy to understand manner.

Steinberg [10] mentions that the process of small-group coaching can generate leadership development impacts that exceed what is possible in one-on-one coaching. Among numerous benefits, they mention this allows the coach and coached to immerse in real-time group dynamics, get an insight into diverse perspectives, and an opportunity to practice new skills in a safe space. Such small group coaching also allows for quickly nurturing a climate of trust and support and developing a collaborative attitude.

Capturing Leadership Traits with Basis of Estimate

Project stakeholders typically review capital cost estimates in a workshop type setting. This deliverable is a product of many person-hours, based on a set of assumptions, referencing a set of documents, applicable for a given period. Leadership traits provide an additional variable to the cost estimating team in presenting their work, and helps them communicate an additional dimension of the cost estimate development process. Aligning leadership traits with cost estimate development process can be recorded in the form of tangible and intangible metrics.

Intangible metrics

Intangible measures depend on the reviewer and their abilities to interview and interpret the team's answers. Intangible review of such measures should not be confused with intangible asset measurement. Further research may be required to understand existing intangible metrics and potential means to capture them during cost estimate development process.

Tangible metrics

There are several ways to tangibly capture some leadership traits, either with the BOE, as an attachment to a submission or in an interview process.

<u>Project/ Program - Pre-Construction stages</u>

The procurement process, for example via RFP requests, allows project stakeholders to incorporate tangible metrics in hiring a project controls team. This step should be further examined for procurement method, contract delivery, and owner risk profile to include tangible measures in analyzing leadership traits of the cost estimating team.

Any standardized questions must avoid all forms of bias, and it may be suitable to prepare a scoring rubric in advance. For a cost estimating procurement process, project stakeholders may request proposed teams to provide customized leadership traits assessments.

Open-ended questions as well as multiple choice questions may be utilized. These may include, for example –

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a. Have team members received any leadership coaching, or will they receive such coaching during the performance of services for this proposal?

b. Has the proposed team worked together in providing similar services on a previous project? If yes, explain any leadership traits reported by the team to project stakeholders.

c. Have team members evaluated their leadership traits, using any commercially available vendors? If yes, provide reference reports.

Answers to these questions provide the scoring team with an additional data point in picking a suitable team.

These questions serve as an example and may be revised based on the needs and expectations of the project team. These responses can be further captured over a period of multiple projects, and the success of failure of such questions can be statistically reported using metrics like Comparison to bid costs, Comparison to missed scope, and Comparison to quantity of change orders.

Project/ Program – Construction stages

During project construction phases, project controls deliverables are a key measure for the ownership stakeholders to understand project health.

Cost estimating deliverables provides the ownership team with the opportunity to present various leadership traits involved in the submission. These traits can be "continuously captured" with the BOE. For a cost estimating team on large capital projects, typical deliverables include Order of Magnitude estimates (Class 5 through 3), Independent Cost Estimate (Class 2), Class 1 estimates, What-If estimates, Value Engineering studies, Change order estimates, etc. The author recommends further investigating "continuously capturing" leadership traits along with project deliverables.

The owner may also focus on Class 2 or Class 1 estimates throughout their capital program to build a baseline for leadership traits, as these are well defined by [1], "attributes like – Maturity level or Project Definition Required, End Usage, Estimating Methods used, Expected Accuracy Range, and with alternate estimate names, terms, and synonyms."

Project/ Program – Commissioning/ Close-out stages

In close-out phases, large owners or owners with multiple projects can record metrics that may explain a causal relationship between project outcomes and leadership traits. Project outcomes may reflect trends identifying specific leadership traits that have higher Return on Investment during construction project development stages. It may also help all project stakeholders obtain formal training on leadership traits. This may directly contribute to healthier project progress.

Conclusion

Capital cost estimates are complex deliverables typically developed in a team environment. The team consists of estimators that regularly interact via drawings, emails, and project documents in the development of the capital cost estimate. These estimates not only face project constraints, but also cost estimate development constraints due to project delivery, market forces, and vendor management. Hence, the cost estimating team's leadership traits provide an additional insight into the cost estimate's development process.

Such leadership traits are well documented and accepted in business applications. The paper identifies six traits as an initial proof of concept – asking, active listening, conflict resolution, empathy, coaching, and influence. These traits can be tangibly or intangible captured, and actively or passively practiced by the project team. The author

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suggests that project stakeholders provide these to their cost estimating teams to include along with their basis of estimate submissions.

Capital project stakeholders can utilize a checklist to understand if the cost estimating team has identified if these traits are understood and have captured their effects on the cost estimate development process.

The checklist includes below seven questions –

a. Asking: What were the top three questions presented by the team during the development of this cost estimate? How were they resolved? And what was the effect of these questions in the cost estimate?

b. Active Listening: What were the top three inter-team or intra-team conversations – written or oral, that affected the cost estimate? What was the impact of these conversations? Do any of these conversations support a Value Engineering exercise?

c. Conflict Resolution: Where were the top three conflicts experienced by the team during the development of this cost estimate? How were they resolved? What was the impact of these conflicts on the cost estimate?

d. Empathy: When empathizing with another team member (internal or external), what were the team's top three experiences? How did they impact on the cost estimate?

e. Coaching: Has the team or team members received any executive coaching, or peer-to-peer coaching? If yes, has an assessment been included in this coaching exercise?

f. Influence: External to the team, who were the top three influencers to the cost estimate? What was the impact of such influences?

g. Has the team identified any other leadership traits, i.e., Strategizing, Vulnerability, Trust, Authenticity etc. in developing the cost estimate? If yes, please provide how they have affected the total project cost?

Like the above referenced checklist, another potential gap remains in standardizing these traits, either as a recommended practice or as an additional component of existing recommended practices. Existing recommended practices like AACE's RP 34R-05: Basis of Estimate is a prime candidate to include leadership traits as an additional component of capital cost estimate's basis of estimate document.

Similarly, the cost classification matrix provided for the Road and Rail Transportation Infrastructure Industries i.e., AACE RP 98R-18 may benefit from an additional secondary characteristic. Leadership traits are assumed to be inversely proportional to the primary characteristic of project definition maturity levels, i.e., as project maturity is lower, project owners must expect higher leadership traits from the cost estimating team. This may be researched further, and a proof-of-concept example is included in Table 3 below.

Table 3: Leadership traits as proof of concept - Secondary Characteristic for Cost Estimate Classification Matrix

	Primary Characteristic	*Secondary Characteristic*
ESTIMATE CLASS	Maturity Level of Project Definition Deliverables	Leadership Assessments Reported by Cost Estimating Team members
Class 5	0% to 2%	At least 90% of team
Class 4	1% to 15%	At least 75% of team
Class 3	10% to 40%	At least 75% of team
Class 2	30% to 75%	At least 75% of team
Class 1	65% to 100%	At least 50% of team

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There are several leadership assessment methodologies available commercially and trademarked, including Leadership Circle Profile, BlueEQ Self-Assessment, Clifton Strengths 34, and several others customized by vendors specific to skill level, industry, and goals. These can be standardized for projects or become a requisite when procuring professionals on capital construction projects. Large owners and engineering vendors may also choose to provide project and industry specific coaching programs.

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