

Introduction to Estimating Project Work: Effort and Uncertainty

- Learn to explain scope, basis, and uncertainty instead of pretending to be precise.
- Estimation matters for project success, team trust, and psychological safety.
- Avoid false precision, estimate-as-commitment, padding wars, and blame cultures.
- Software projects overrun original time estimates by 70–80% on average (Capers Jones).



The Real Cost of False Precision

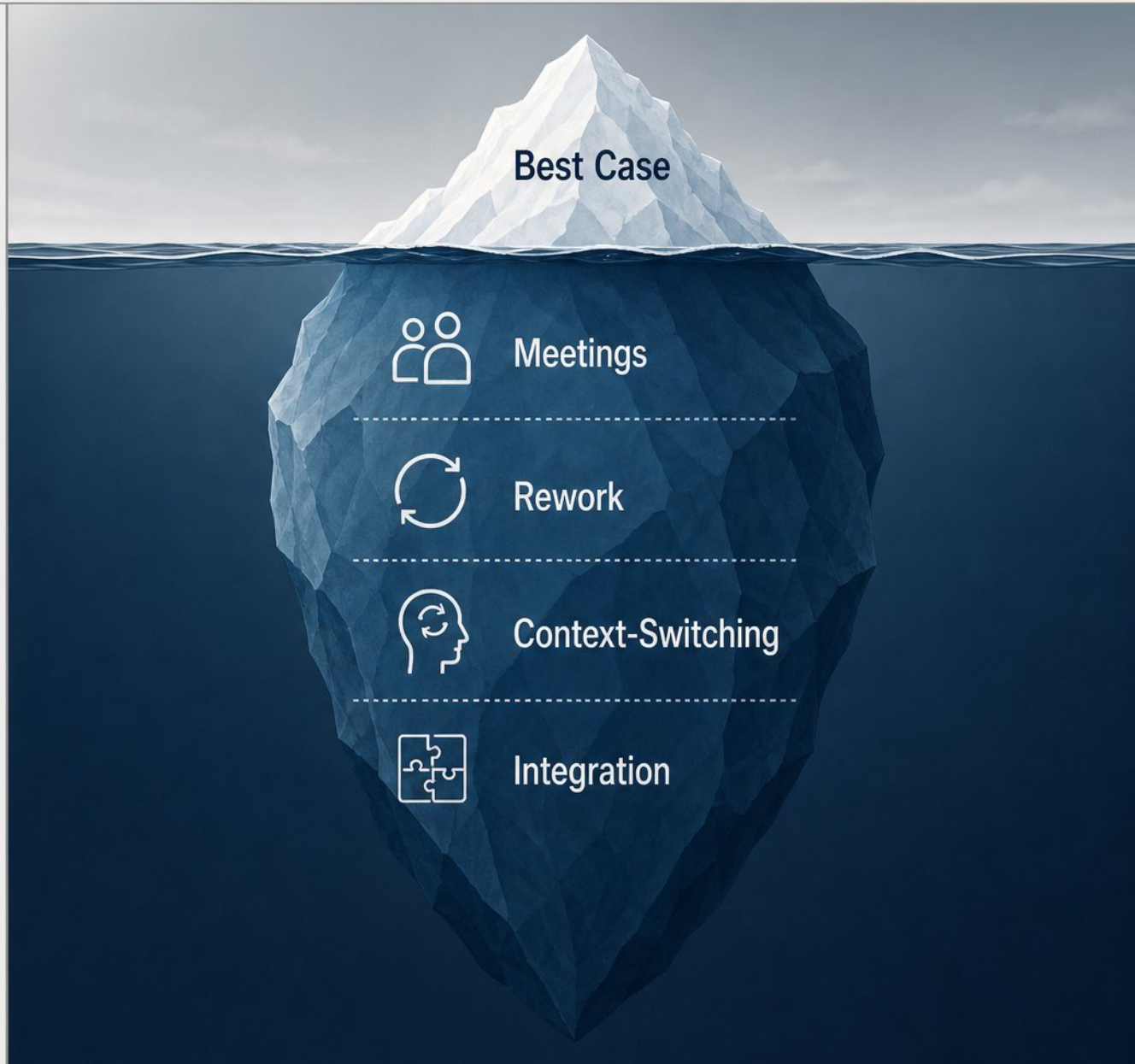
- Estimate-as-commitment turns honest guesses into binding contracts.
- The system punishes honesty: "the rational move is to estimate safely, not honestly" (Agarwal, 2026).
- More detail hides uncertainty; it doesn't reduce it.
- The real problem is what happens after the estimate leaves your mouth.



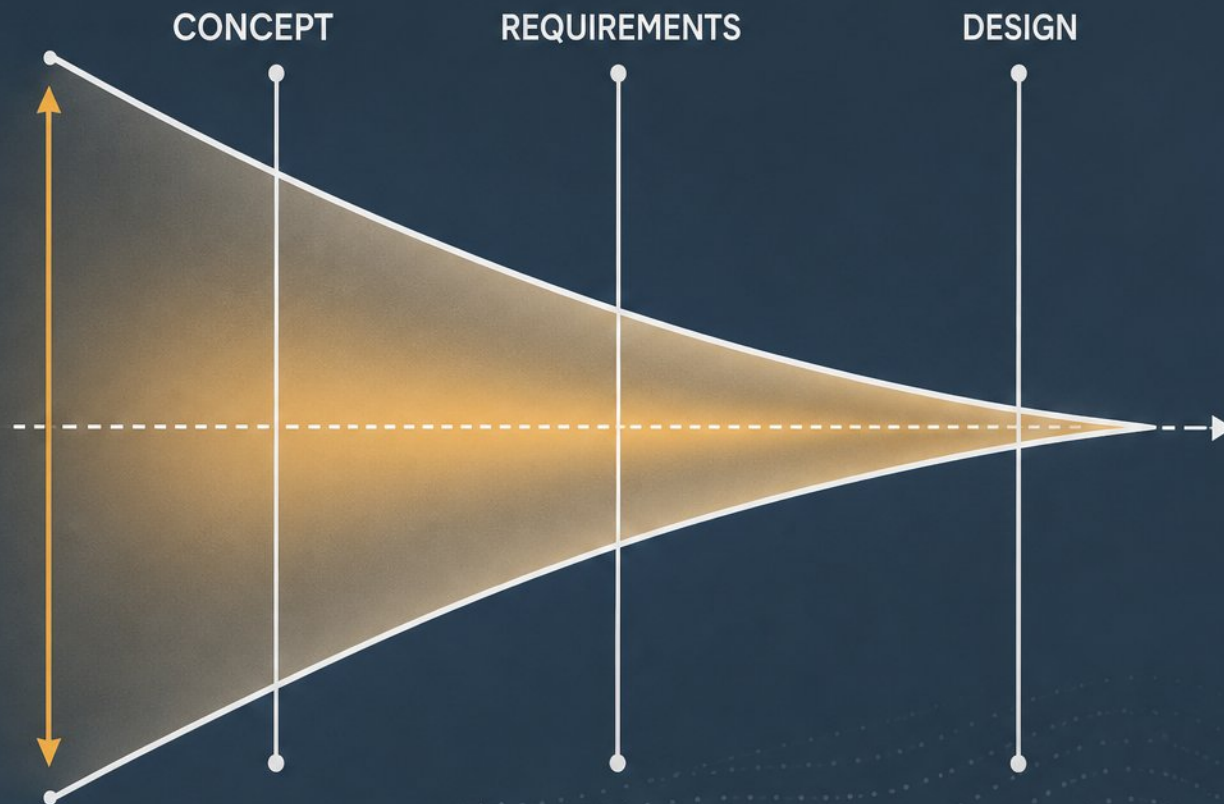
Why Estimation Is Hard:

The Planning Fallacy and Hidden Work

- Planning fallacy: systematic 40–60% underestimation regardless of experience
- Inside-view focus ignores historical data and simulates best cases
- Hidden work: reviews, rework, onboarding, context-switching, integration
- Authorization imperative: personal stake in approval encourages lowballing



The Cone of Uncertainty: Your Best-Case Accuracy at Each Stage

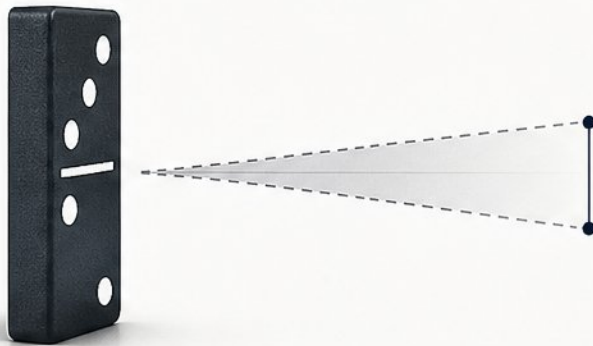


- Represents minimum possible error for skilled estimators at each stage
- Initial Concept: estimates off by 4x in either direction (16x spread)
- After detailed requirements: narrows to roughly $\pm 10\text{--}15\%$
- Narrows only with decisions that reduce variability, not calendar time

Separating Effort from Duration and Single Points from Ranges

Single Point

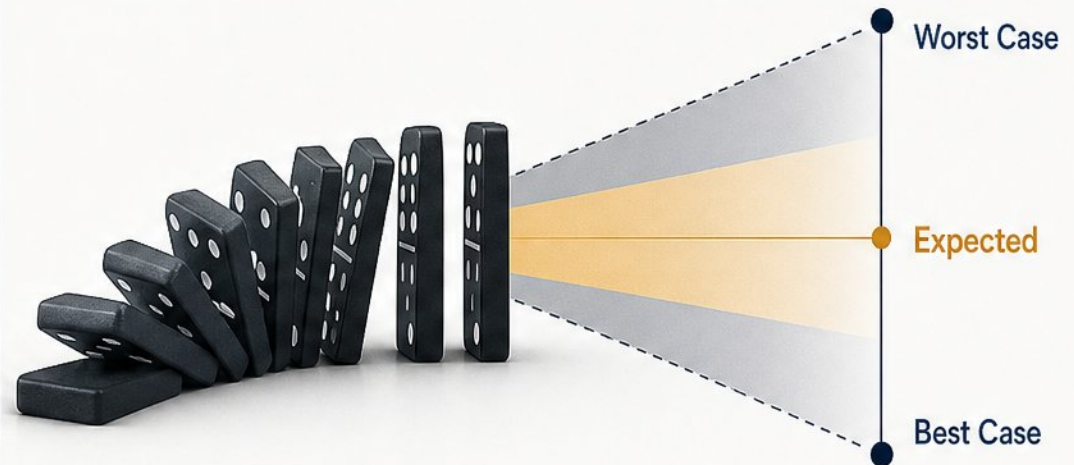
One value. No visibility into uncertainty.



Low visibility. False certainty.

Range

A spectrum. Visibility into uncertainty.



Honest ranges. Informed decisions.

- ✓ A 2-hour task with a 3-day dependency takes 3 days, not 2 hours.
- ✓ Single-point estimates hide uncertainty; they don't remove it.
- ✓ Ranges with confidence levels show best case, expected, and worst case.
- ✓ Order-of-magnitude ranges ("30–50 hours") are more honest than false precision.

The Basis of Estimate: Making Your Assumptions Explicit

- A Basis of Estimate (BoE) answers: "How did you arrive at that number?"
- Core BoE components: scope, methodology, data sources, assumptions, confidence range, exclusions
- Assumptions are the invisible foundation: track validation, impact, and lifecycle
- A credible estimate, backed by a BoE, enables productive change conversations



Uncertainty Decomposition: Known-Knowns to Unknown-Unknowns

A NATURALIST'S TYPOLOGY OF UNCERTAINTY

KNOWN-KNOWNS

The solid ground.



KNOWN-UNKNOWNs

The known unknowns.



UNKNOWN-KNOWNs

The unknown knowns.



UNKNOWN-UNKNOWNs

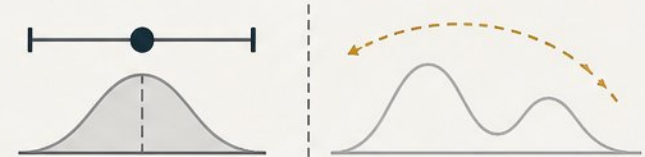
The unknown unknowns.



- **Rumsfeld matrix:** known-knowns, known-unknowns, unknown-unknowns



- **Parametric vs. structural:** variable ranges vs. wrong problem



- **Aleatoric** (random) vs. **epistemic** (reducible) uncertainty



- **Surface unknowns:** assumption validation, pre-mortems, reference classes



The Pre-Mortem: Surfacing Risks by Imagining Failure

- Structured 30-min exercise: assume the project already failed and work backward
- Prospective hindsight improves failure cause identification by ~30%
- Steps: frame failure scenario, silent writing, round-robin sharing, prioritize
- Outputs feed the risk register and calibrate three-point estimate ranges



Three-Point Estimating and PERT: Turning Ranges into Numbers



Replace single-point guesses with Optimistic, Pessimistic, and Most Likely values



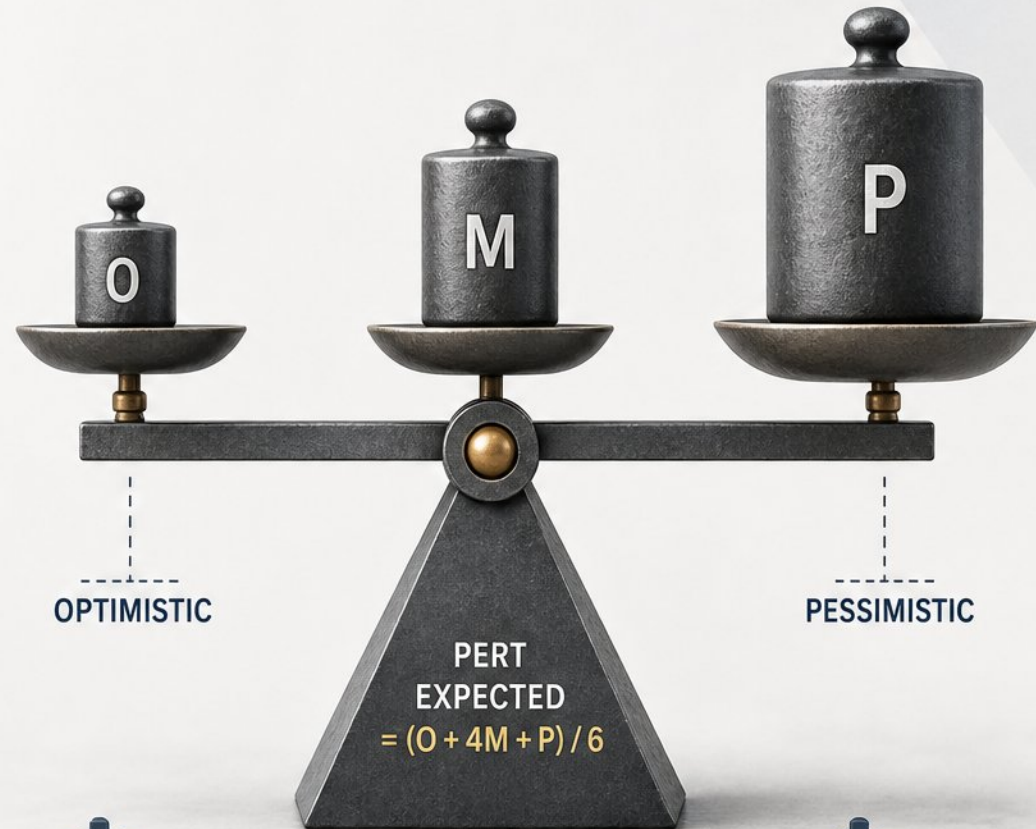
PERT Expected = $(O + 4M + P) / 6$;
SD = $(P - O) / 6$



Produces a realistic ceiling and floor, not false precision



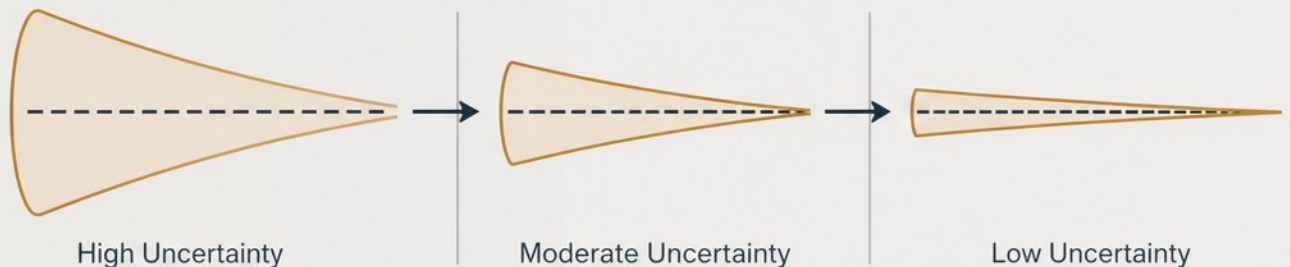
Worst case is a planning scenario, never a commitment



— THE BRIDGE BETWEEN NUMBERS —

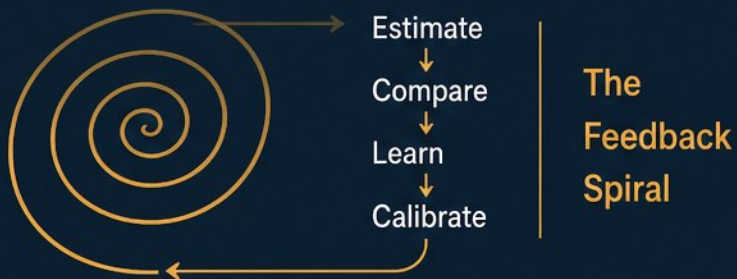
Estimation Techniques: Choosing the Right Fidelity for the Moment

- - T-shirt sizing & affinity grouping for early, high-uncertainty work (ROM $\pm 50-100\%$)
- - Planning Poker & story points leverage relative comparison over absolute guesses
- - Bottom-up WBS estimation delivers definitive accuracy ($\pm 5-10\%$)
- - Match technique to information: finer detail only when the cone has narrowed



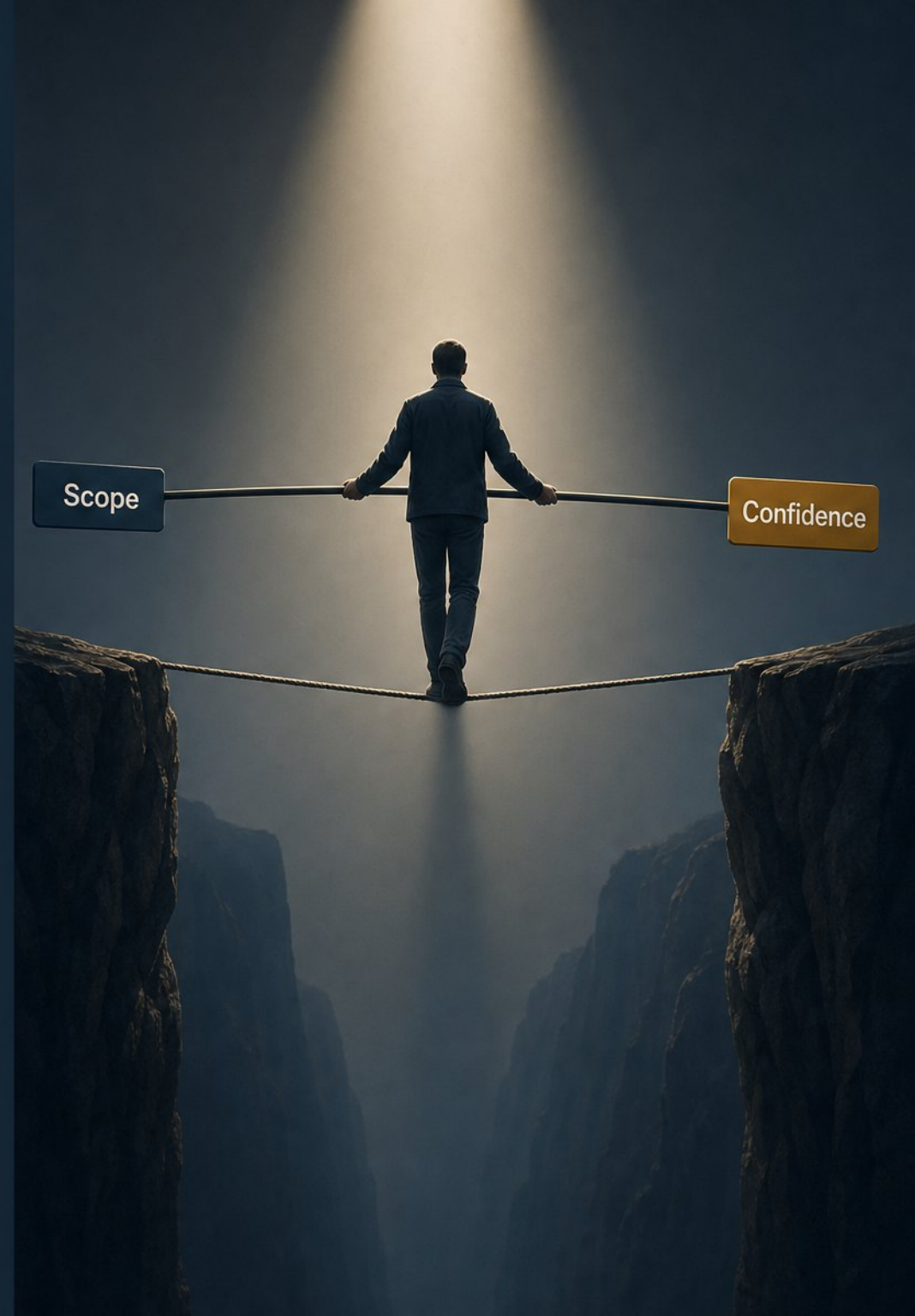
Estimating with History: Reference Classes and Calibration

- Anchor estimates in outcomes from similar past projects, not optimism
- Ask: 'How long did similar work actually take?' — the outside view
- Track estimate-to-actual ratios over 8–12 cycles to calibrate
- PRED(25) target: >75% of estimates within $\pm 25\%$ of actuals
- Structured tracking turns estimation from guessing into improvable skill



Communicating Estimates to Stakeholders Without Sounding Evasive

- ▶ Lead with your recommendation, not caveats—executives pay for judgment.
- ▶ Replace vague hedges with quantified uncertainty and confidence levels.
- ▶ Framework: Scope + Basis (data) + Range + Confidence Level.
- ▶ When pressed for a single number, commit to the high end of your range.



Handling Pressure: When Stakeholders Demand Certainty



- **Reframe:** "I can't give certainty, but I can give odds based on similar initiatives."



- **Too early to commit?** A small discovery phase buys precision and lowers risk.



- **Share probability-weighted impacts**, not a list of every failure mode.

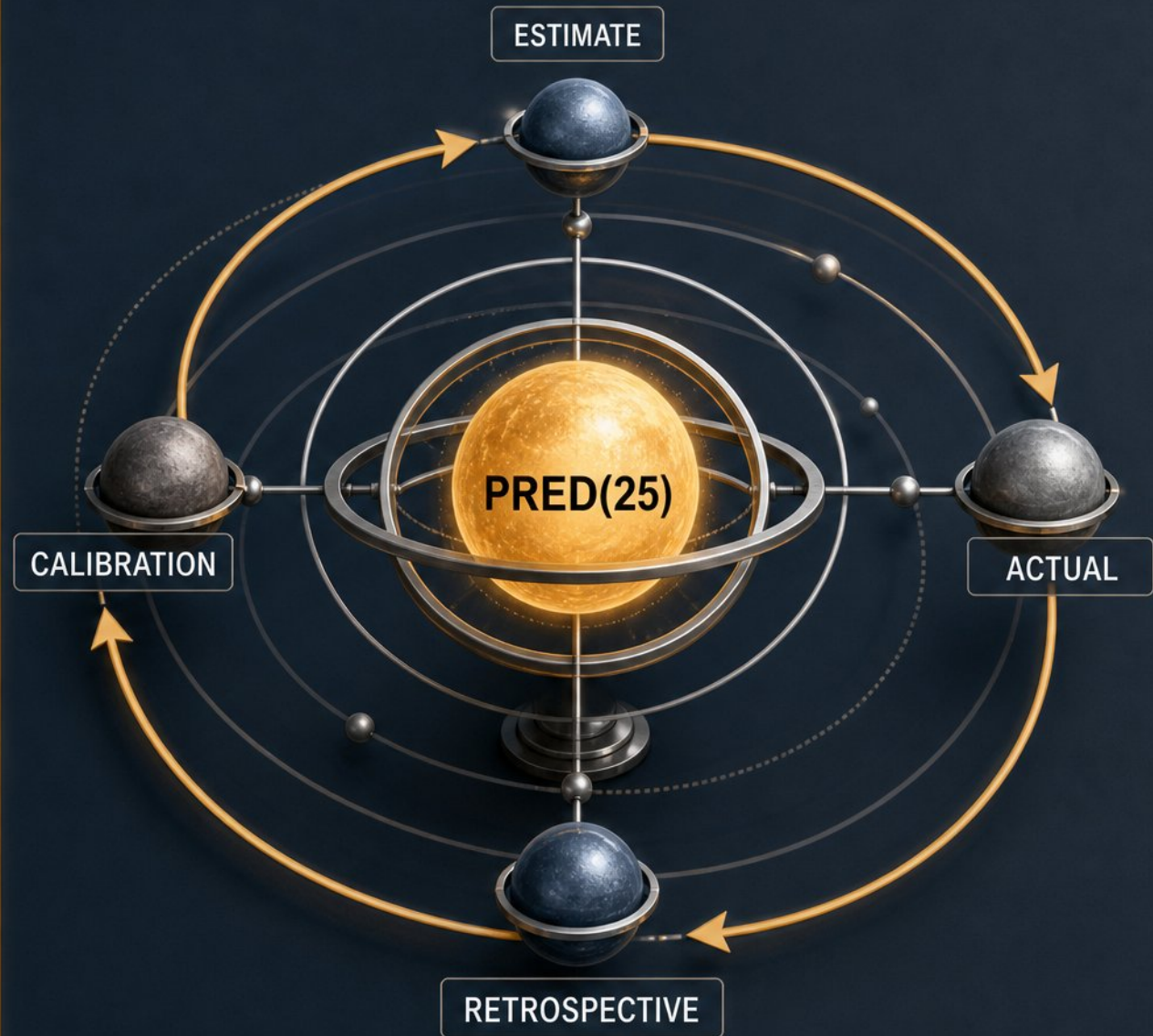


- **Present alternatives** tied to risk tolerance, e.g., ship now vs. investigate further.



Refining Estimates Over Time: The Continuous Feedback Loop

- Estimation is continuous; rolling-wave planning syncs with current knowledge.
- Track Estimate Accuracy ($\text{Original/Actual} \times 100$) and SPI.
- Analyze large variances in retrospectives to spot optimism bias and scope creep.
- Target PRED(25): >75% of estimates within $\pm 25\%$ of actuals after 8–12 cycles.



Putting It into Practice: An End-to-End Estimation Scenario



Step 1: Define scope, exclusions, and key assumptions in a BoE



Step 2: Run a pre-mortem to surface risks that break the estimate



Step 3: Use three-point estimation calibrated with historical data



Step 4: Communicate P50 and P80 bands with a clear recommendation

Checklist and Next Steps for Your Next Estimate



Pre-estimation:

define scope, document assumptions, gather historical data.



During estimation:

use ranges or three-point; never offer a single number early.



Before communicating:

pre-mortem, calibrate, prepare quantified confidence.



After delivering:

schedule re-estimation, track actuals, run retrospectives.



Core takeaway:

"A single number is a lie of omission."
—Jon Moshier, 2026



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