

Deciding When Evidence Is Incomplete

Executive Brief

This brief gives an accountable executive the minimum structure needed to update beliefs, compare actions under asymmetric consequences, decide whether further evidence is worth waiting for, and record a defensible authorization. It condenses Module 3 without removing the assumptions that make its recommendations auditable.

Control	Specification
Module	EP-M03
Asset	EP-M03-A02 Executive Brief
Decision vocabulary	ACT, PILOT, WAIT AND LEARN, ESCALATE
Terminal record	Evidence Update and Decision Loss Matrix
Priority sectors	Agriculture, Education, Health, Habitat

Executive conclusion

A posterior probability does not authorize an action. The defensible choice minimizes expected loss subject to rights, safety, legal, budget, and distributional constraints. Leaders should approve the recommendation only when the prior, evidence model, loss structure, sensitivity range, learning plan, and decision authority are visible.

The governed decision system

Element	Executive question	Required record
State	What consequential condition may exist?	States include adverse and omitted possibilities.
Prior	What was believed before the new evidence?	Source, date, population, and disagreement range.
Evidence	How probable is this evidence under each state?	Likelihoods, quality limits, and dependence risks.

Element	Executive question	Required record
Posterior	What should now be believed?	Updated probabilities with sensitivity bounds.
Loss	What harm follows from each action-state pair?	Financial, human, environmental, rights, and trust effects.
Action	Which admissible action has lowest posterior expected loss?	ACT, PILOT, WAIT AND LEARN, or ESCALATE.
Authority	Who may decide and under what conditions?	Named owner, review date, triggers, and exit rules.

Core calculations

$$\text{Posterior odds} = \text{Prior odds} \times \text{Likelihood ratio}$$

$$\text{Posterior expected loss of action } a = \sum_s P(s \mid \text{evidence}) \times L(a, s)$$

$$\text{EVPI} = \text{Minimum current expected loss} - \text{Expected loss with perfect information}$$

Canonical agriculture case. A severe outbreak has prior probability 0.40. A positive signal has probability 0.80 under a severe outbreak and 0.30 under a limited outbreak. The posterior probability of severe outbreak is 0.64. Monitoring loses 20 under a severe outbreak and 0 otherwise. Intervention loses 8 under a limited outbreak and 0 otherwise. Posterior expected loss is 12.80 for monitoring and 2.88 for intervention. The decision threshold is $8 \div (20 + 8) = 0.286$, so intervention is preferred if no hard constraint blocks it.

Authorization sequence

1. Define the decision, admissible actions, states, population, time horizon, and accountable authority.
2. Document the prior and its provenance before examining the new signal.
3. Assess the evidence likelihoods, measurement error, dependence, transportability, and possible manipulation.
4. Update beliefs and show a credible range rather than a single unqualified estimate.
5. Specify losses for every action-state pair and identify non-compensatory constraints.

6. Compare posterior expected loss, then test prior, likelihood, loss, and missing-state sensitivity.
7. Compare the value of more information with its monetary cost, delay, and foregone benefit.
8. Authorize ACT, PILOT, WAIT AND LEARN, or ESCALATE with monitoring triggers and an expiry date.

Sector translation

Sector	Uncertain state	Evidence	Asymmetric loss	Likely governance focus
Agriculture	Severe outbreak	Field and remote-sensing signals	Delayed control versus unnecessary treatment	Season timing, ecological constraint, smallholder exposure
Education	Intervention improves learning	Pilot assessment and attendance	Scaling failure versus delayed benefit	Subgroup effects, implementation fidelity, teacher burden
Health	Patient or population faces high risk	Diagnostic or surveillance evidence	Missed treatment versus overtreatment	Safety, clinical authority, consent, referral
Habitat	Structure or settlement faces unsafe exposure	Inspection, sensor, hazard evidence	Missed failure versus unnecessary displacement	Life safety, tenure rights, vulnerable residents

Approval questions

- Would a credible change in the prior reverse the action?
- Would plausible diagnostic error or evidence dependence reverse the action?
- Which loss judgment drives the recommendation, and who owns that judgment?
- What state is missing from the model, and what signal would reveal it?
- Who bears false-positive and false-negative losses?
- Does more evidence have positive net value after delay and foregone benefit?
- What trigger changes, pauses, or terminates the authorized action?

Minimum executive record

Field	Entry
Decision and authority	
States and actions	
Prior and provenance	
Evidence and likelihoods	
Posterior range	
Loss matrix and hard constraints	
Recommended action	
Sensitivity and reversal points	
Information-value decision	
Monitoring triggers	
Review date and expiry	
Sign-off	