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Adaptive Tools for Complex Projects

Three capabilities for project controls under uncertainty: a comparative reading of PMBOK® 6, 7 and 8 and AACE International Recommended Practices.

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AUDIENCE

Project managers, planners and project controls professionals

Your projects, on time and on budget.

EXECUTIVE SUMMARY

Choose the tool last

In complex projects the most common mistake is not choosing the wrong tool, but choosing it too early. Context must be read first, the value to be delivered must be defined second, and only then should a technique be selected. When this order is reversed, the tool imposes a deterministic reading on an environment that is not deterministic.

Taleb (2007) frames the problem through his distinction between *Mediocristan* and *Extremistan*. Managers who act as if everything were predictable are exposed to black swans: improbable events that break the established order. Managers who accept uncertainty design their controls to absorb it.

01

Read uncertainty

Model what we do not know: from single-point CPM to probabilistic schedules.

02

Adjust time without losing direction

Compress the schedule on the critical path without trading away scope or quality.

03

Sustain value over time

A monitoring plan that is both robust and able to revise its own indicators.

KEY TAKEAWAYS

1. **PERT is a mindset shift, not just a formula.** AACE goes further: Monte Carlo simulation on the full CPM model avoids the merge bias that makes PERT underestimate duration.
2. **Schedule compression has moved from correction to governance.** In PMBOK 8 crashing and fast tracking become continuous, data-driven decisions; AACE adds that every acceleration must be documented.
3. **Indicators are designed during planning, not at the end**, and are adjusted in action. The hybrid PMBOK 8 approach combines earned value with value-delivery metrics.
4. **PMBOK and AACE are complementary.** PMBOK 7 and 8 explain *why* to adapt (value); AACE explains *how* to do it with evidence.

CAPABILITY 01

Read uncertainty

The first adaptive capability is acknowledging what we do not know. The transition from CPM to PERT illustrates this well.

CPM · deterministic

Developed at DuPont in the late 1950s under a closed-system logic: one duration per activity, risk not modelled.

PERT · probabilistic

Developed for the U.S. Navy Polaris program: three estimates per activity (optimistic, most likely, pessimistic) turn the schedule into a probability distribution.

$$t_e = (a + 4m + b) / 6$$

Expected time per activity: a = optimistic, m = most likely, b = pessimistic

More than a mathematical refinement, PERT is a change of stance: the project stops being a certain plan and becomes a range of scenarios.

AACE perspective. RP 57R-09 recommends Monte Carlo simulation on the complete CPM model. Where several paths converge on a single milestone, the successor is riskier than any of the merging paths (*merge bias*), an effect that classic PERT ignores and that leads it to underestimate total duration.

Collaborative diagnosis complements these techniques. Each stakeholder sees a different part of the problem; bringing together technical teams, users and decision-makers at different levels reduces blind spots before objectives and indicators are fixed. Properly understood, risk is not only a threat: it is a source of learning that keeps the team alert.

CAPABILITY 02

Adjust time without losing direction

The second capability is responding to change without giving up scope or quality. The critical path, calculated through the forward and backward passes, identifies the activities with zero total float: this is where the schedule lever sits (AACE RP 49R-06). Two compression techniques act on it:

Crashing

Add resources to critical activities. Shortens duration at the cost of higher spend and diminishing returns.

Fast tracking

Overlap activities originally planned in sequence. Saves time at the cost of rework and integration risk.

A typical example: bringing forward the purchase of key equipment for a critical activity can save weeks, but the saving is paid for in the budget. The real question is not whether the schedule *can* be compressed, but whether the value of the time gained justifies its cost.

How the role of compression evolves across PMBOK editions

PMBOK 6	PMBOK 7	PMBOK 8
PMI, 2017	PMI, 2021	PMI, 2025
Deterministic tools within the schedule development process.	Integrated into the planning and delivery domains, guided by adaptability principles.	A dynamic governance mechanism fed by actual performance data.

AACE perspective. Compression can turn a near-critical path into a critical one, so near-critical paths must be monitored too (RP 92R-17). And every acceleration should be documented and analysed (prospective time impact analysis, RP 52R-06; forensic schedule analysis, RP 29R-03), because in engineering and construction it often ends in a contractual dispute.

CAPABILITY 03

Sustain value over time

The third capability is keeping the project aligned with the value it must generate, not only with its deliverables. The central tool here is the **monitoring plan**, provided it meets two conditions that seem to pull in opposite directions:

Robustness
Objective measurement, formal documentation and traceability.

Versatility
The ability to revise even the indicators themselves.

Indicators must be designed during planning, not at the end, and they are never perfect at the start: they are adjusted in action. The plan works as a cycle of diagnosis, indicators, monitoring architecture, control and continuous improvement rather than as a linear sequence. This is the same plan–measure–assess–act logic that underpins the AACE *Total Cost Management Framework*.

Beyond the project

- **Bastida and Molas** propose integrating the Sustainable Development Goals into organisations in three phases: prioritise, measure with indicators, and report to stakeholders. In practice, this is a monitoring plan at strategic scale.
- **Díaz and Piorun** show that agility born in operational teams (Scrum, Kanban) is not enough unless it reaches corporate governance; they call this next stage *strategic agility*. An adaptive team inside rigid governance loses much of its ability to respond.

This is why the hybrid PMBOK 8 approach is sensible: it keeps the structural metrics of the sixth edition (earned value, S-curves, variances) and integrates them with the value metrics of the seventh (incremental value, delivery velocity, stakeholder satisfaction). AACE supplies the operational rigour through earned value consistent with EIA-748-C (RP 82R-13), variance analysis (RP 86R-14) and estimate at completion (RP 80R-13), which together move control from measuring the variance to forecasting the outcome.

COMPARATIVE VIEW

PMBOK and AACE: complementary, not competing

Capability	PMBOK 6 / 7 / 8	AACE International	What AACE adds
Reading uncertainty	PERT, three-point estimates	57R-09 · 40R-08	Monte Carlo on the full network; avoids merge bias
Critical path	Forward and backward passes, zero float	49R-06 · 92R-17	Monitor near-critical paths as well
Compression	Crashing and fast tracking	91R-16 · 52R-06 · 29R-03	Document and justify every acceleration
Baseline	Baseline (v6), adaptation (v7)	27R-03 · 37R-06 · 38R-06	Declare schedule maturity (Class 5 to 1) instead of assuming it
Performance	EVM (v6), value (v7), hybrid (v8)	82R-13 · 86R-14 · 80R-13	Move from variance to forecast

In short, PMBOK 7 and 8 provide the **why** of adaptation (value), while AACE provides the **how**, backed by evidence.

Implications for research

A doctoral thesis is itself a project under uncertainty. Estimating research phases with three scenarios, identifying critical activities (data access, instrument validation) and defining revisable progress indicators from the outset protect research from its own black swan. Systematic documentation is the basis of any evidence: what is not recorded cannot be analysed or replicated.

AN OPEN QUESTION FOR THE COMMUNITY

If schedule compression becomes a continuous, data-driven governance decision, which indicator should trigger it in your projects: schedule variance, or the value lost for every week of delay?

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- 29R-03 Forensic Schedule Analysis
- 37R-06 Schedule Levels of Detail – As Applied in Engineering, Procurement and Construction
- 38R-06 Documenting the Schedule Basis
- 40R-08 Contingency Estimating – General Principles
- 49R-06 Identifying the Critical Path
- 52R-06 Prospective Time Impact Analysis – As Applied in Construction
- 57R-09 Integrated Cost and Schedule Risk Analysis Using Monte Carlo Simulation of a CPM Model
- 80R-13 Estimate at Completion (EAC)
- 82R-13 Earned Value Management (EVM) Overview and Recommended Practices Consistent with EIA-748-C
- 86R-14 Variance Analysis and Reporting
- 91R-16 Schedule Development
- 92R-17 Analyzing Near-Critical Paths

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