Schedule Risk Analysis

Monte Carlo simulation of the Merlin Project plan “Anbau Bürogebäude” (office building extension)

Prepared 25 June 2026 · 10,000-iteration Monte Carlo per scenario · durations ±20% PERT · baseline finish 21 Aug 2026

Executive summary

A 10,000-run Monte Carlo simulation of the office-building-extension plan shows that the baseline finish date of 21 August 2026 is a coin-flip, not a commitment: it is achieved in roughly half of all runs. A reliable (P90) finish is 26 August – about three working days of buffer. The schedule is dominated by a single long chain of twelve tasks that are critical in essentially every run, which keeps the overall spread narrow (P10 to P90 spans only one week).

Two named risks were tested. A late façade-material delivery from the cheaper supplier never moves the finish date, because the delivery sits behind roughly 21 working days of float; paying a €4,000 premium for a guaranteed-on-time supplier therefore buys no schedule improvement. A ten-day absence of the structural engineer does move the finish – and an early absence (week 3, on the critical structural design) hits about two working days harder than a late one (week 8), which still carries a little float.

Finding	Evidence from the simulation
The plan date is a coin-flip	21 Aug 2026 is met in ~49% of 10,000 runs.
A reliable date needs a buffer	P90 finish is 26 Aug 2026 – about 3 working days beyond plan.
The cheaper supplier is rational	Supplier A’s possible +10-day delay never moves the finish; B’s €4,000 premium buys 0 days.
Timing beats duration for outages	An early engineer absence delays the finish ~2 working days more than a late one (+10 vs +8 wd).
One serial chain drives the date	Twelve tasks are critical in ~100% of runs; the procurement / façade branch never drives the finish.

1. Project at a glance

The plan describes a two-storey office building extension scheduled over twelve weeks. It is organised in five phases linked almost entirely finish-to-start, with a single long critical chain running from design through to handover. The procurement and façade activities form a side branch that runs in parallel with substantial float.

Attribute	Value
Project	Two-storey office building extension
Source plan	Merlin Project — “Anbau Bürogebäude”
Baseline start / finish	1 Jun 2026 / 21 Aug 2026
Baseline duration	60 working days (~12 weeks)
Working calendar	Monday–Friday, 8 h / day
Scope	28 activities (15 work packages, 7 milestones), 5 phases
Logic	27 links (26 finish-to-start, 1 start-to-start)
Resources	8
Critical path	Design → structural → permit → shell → services → fit-out → handover

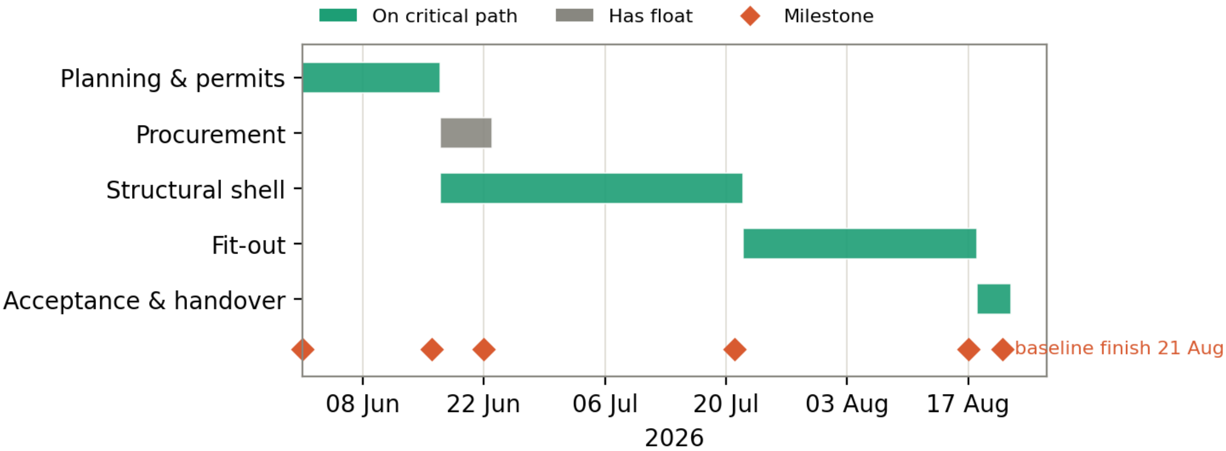

Figure 1. Baseline schedule. Teal bars sit on the critical path; the grey procurement bar carries float. Diamonds mark milestones.

2. Baseline schedule risk

Holding the plan logic fixed and letting every task duration vary by ±20% (symmetric PERT), the finish date spreads as shown below. The deterministic plan date lands almost exactly on the median – the classic signature of an optimistic plan.

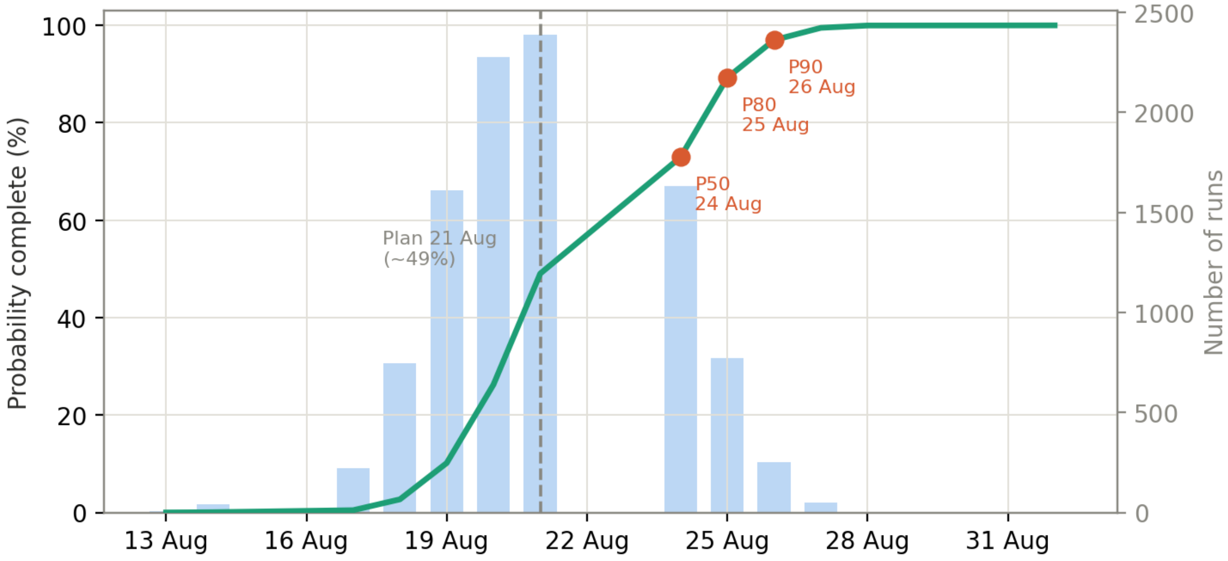

Figure 2. S-curve of the finish date over 10,000 runs. Bars show how often each date was the finish; the teal line is the cumulative probability; coral dots mark P50/P80/P90; the dashed line is the plan date.

Confidence	Finish date	Versus plan
Plan (deterministic)	21 Aug 2026	~49% likely to be met
P50 (median)	24 Aug 2026	+1 working day
P80	25 Aug 2026	+2 working days
P90	26 Aug 2026	+3 working days
Full range	17 Aug – 1 Sep 2026	minimum to maximum of all runs

Reading. The plan date is met in about half the runs and missed in the other half. To commit with 90% confidence, communicate 26 August – roughly three working days of buffer. The distribution is unusually tight because one long serial chain (design, structural, permit, shell, building services, fit-out, acceptance) dominates: those twelve tasks are on the critical path in essentially every run, and their over- and under-runs partly cancel out, so total variance stays moderate.

3. Risk A — Façade material supplier

The activity “material installed (façade)” depends on two predecessors: the material delivery and the roof (which is on the critical path). Supplier A delivers on time in 85% of cases and ten working days late otherwise; supplier B always delivers on time but costs €4,000 more. The question is whether A’s occasional delay is worth avoiding.

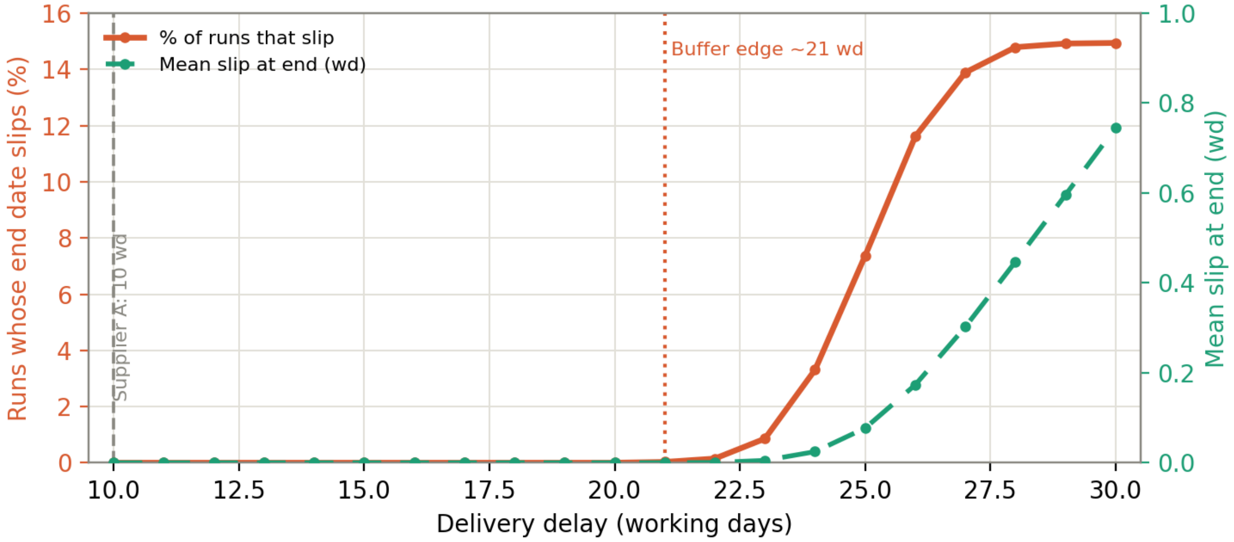

Figure 3. Sensitivity of the finish date to the delivery delay. The share of runs whose finish slips stays at zero until the delay exceeds roughly 21 working days – more than double Supplier A's actual 10-day delay.

Metric	Supplier A	Supplier B
Delivery behaviour	85% on time, else +10 wd	Always on time
Cost premium	—	+ €4,000
P50 finish	24 Aug 2026	24 Aug 2026
P80 finish	25 Aug 2026	25 Aug 2026
P90 finish	26 Aug 2026	26 Aug 2026
Runs delayed versus B	0.00%	—

The finish-date distributions for A and B are identical: in none of the 10,000 runs does choosing A instead of B move the finish. Two buffers absorb the delay – the delivery enjoys a median of about 21 working days of float against the shell (17 wd even in the most compressed run), and the façade work has a further ~4 working days of float against the building-services path at the convergence point.

Delivery delay	Runs whose finish slips
10 wd (Supplier A actual)	0.0%
20 wd	0.0%
22 wd	0.15%
25 wd	7.4%
30 wd	14.9%

Cost verdict. Under these assumptions the €4,000 premium for supplier B buys essentially zero schedule improvement. From a pure schedule standpoint Supplier A is the rational choice. B only becomes worthwhile if the delay could be much larger than ten days, if the shell finished markedly earlier (shrinking the first buffer), or if the façade branch carried its own penalty-bearing interim deadlines.

4. Risk B — Structural engineer outage

The structural engineer works on two activities: structural design early in the project (on the critical path) and structural sign-off late in the project. Three cases were compared with the same random draws: no outage, a ten-day absence in week 3 (hitting the early task), and a ten-day absence in week 8 (hitting the late task).

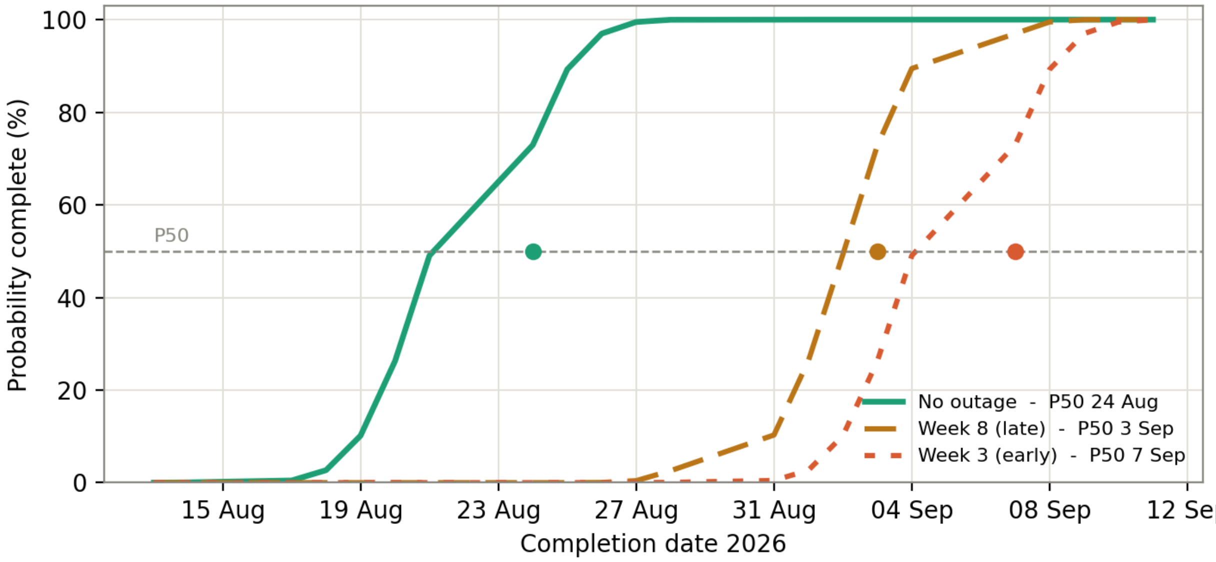

Figure 4. Finish-date S-curves for the three cases. The early outage (coral) sits furthest right in every run; the late outage (amber) is slightly less severe because a downstream task absorbs part of it.

Case	P50	P80	P90	Versus no outage
No outage	24 Aug	25 Aug	26 Aug	—
Week 3 — early (structural design)	7 Sep	8 Sep	9 Sep	+10 working days
Week 8 — late (structural sign-off)	3 Sep	4 Sep	7 Sep	+8 working days

Which timing hits hardest. The early outage is worse in 100% of runs, by about two working days on average. Structural design sits fully on the critical path with no float, so all ten lost days pass straight through to the finish (+10 wd). Structural sign-off runs in parallel with defect-rectification, and that downstream chain absorbs about two of the ten days before the sign-off itself becomes binding (+8 wd). The general lesson: an outage early on the critical path is more expensive than an equally long outage late, when the late task still draws on float from parallel work. Either outage, however, pushes the plan date out of reach – the chance of finishing by 21 August falls from ~49% to zero in both cases.

5. Conclusions and recommendations

- Commit to 26 August, not 21 August. The plan date is a P50; a P90 date adds only ~3 working days of buffer and turns a coin-flip into a reliable commitment.
- Choose the cheaper façade supplier (A). Its occasional ten-day delay is fully absorbed by float and never reaches the finish; the €4,000 premium for supplier B is not justified on schedule grounds.
- Protect the structural engineer’s early window. An absence during structural design is the costliest single resource risk modelled (+10 wd, full pass-through). Securing back-up or buffer around that task yields more than protecting the late sign-off.
- Watch the buffers, not just the bars. Whether a delay reaches the finish depends on float, not on the size of the delay alone. Re-check the procurement / façade float if the shell is ever pulled

forward.

- Manage the serial chain. Twelve tasks drive the date in ~100% of runs. Compression effort (parallelisation, fast-tracking) pays off only on that chain; effort on the parallel procurement branch does not change the finish.

Methodology and assumptions

- 10,000 Monte Carlo iterations per scenario. Within each comparison the same random draws are reused (common random numbers) so that differences are attributable only to the tested change.
- Each task duration is drawn from a symmetric PERT-Beta distribution: most-likely = the planned duration, optimistic = −20%, pessimistic = +20%.
- The delivery delay and the resource outage are modelled as ten working-day shifts of the affected element. Ten calendar days would be about seven working days and would soften the effects without changing the ranking.
- Milestones have zero duration; the project calendar (Monday–Friday, 8 h/day) governs all date arithmetic. The network (28 activities, 27 links) was reconstructed from the Merlin plan and validated – the deterministic pass reproduces the baseline finish of 21 August 2026 exactly.
- The plan’s own embedded three-point estimates (for example, permit O = 16 / M = 24 / P = 80 h) are markedly more skewed than ±20%; using them would lengthen the right tail and push P90 later. The risk events were modelled one at a time, not combined.