Method and application reference

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See how the method works

Begin with a customer need and the work that delivers it. Quality and flow must develop together: a faster stream that passes defects creates rework, while reliable processes still disappoint customers if work waits between them. People need a clear normal condition, permission to surface problems and support when they do. Choose one observable gap and improve it with the team. Follow the result through the whole route, rather than celebrating one machine or department. Use the drawing as a connected explanation of the system, not a mandatory sequence for installing tools.

Read every connection

1. Step 1 > 2
Direction

2. Step 2 > 3
Capability and response

3. Step 2 > 4
Capability and support

4. Step 3 > 4
Reliable flow

5. Step 4 > 5
Expose obstacles

6. Step 3 > 5
Prevent recurrence

7. Step 5 > 2
Learn and update

8. Step 5 > 1
Verify customer result

Connected method map: Customer purpose, People and learning, Jidoka, Just-in-Time, Daily improvement. Every authored connection is shown with a numbered arrow and named legend.

04 / Choose a bounded learning trial

For one approved replenishment cycle, the team verifies kit availability before release and records alarm-response times, complete-set delivery and operator interruptions. It declines an extra machining batch unsupported by customer need.

Why: The trial tests a cause-and-effect prediction across departments. It does not declare that both problems have already been solved.

Evidence / check: Prediction: fewer incomplete releases and unresolved waits, with verified delivery improving and no hidden work.

05 / Review the system result with the people

At the agreed review, compare complete sets, holds and workload with the prediction. If the shortage persists, follow the new evidence rather than asking machining to raise its local target again.

Why: Daily improvement develops the team's ability to see and solve problems; the display is a means to learning, not a scorecard to blame operators.

Evidence / check: Adopt, adapt or stop decision tied to order-level evidence and operator feedback.

Completed system diagnosis - fictional day

Boundary	Fact	Decision
Customer	12 sets short	Review complete orders
Quality	12 bodies held	Resolve alarm through quality owner
Supply	Seal kits unavailable	Trace replenishment information
Machining	110 bodies made	Do not infer customer benefit
Trial	Result not yet observed	Measure delivery and conditions

The held bodies are released

Quality verifies all 12 held bodies, but seal kits are still absent.

Decision

Keep the kit issue open and do not claim 12 additional shipped sets.

Reasoning

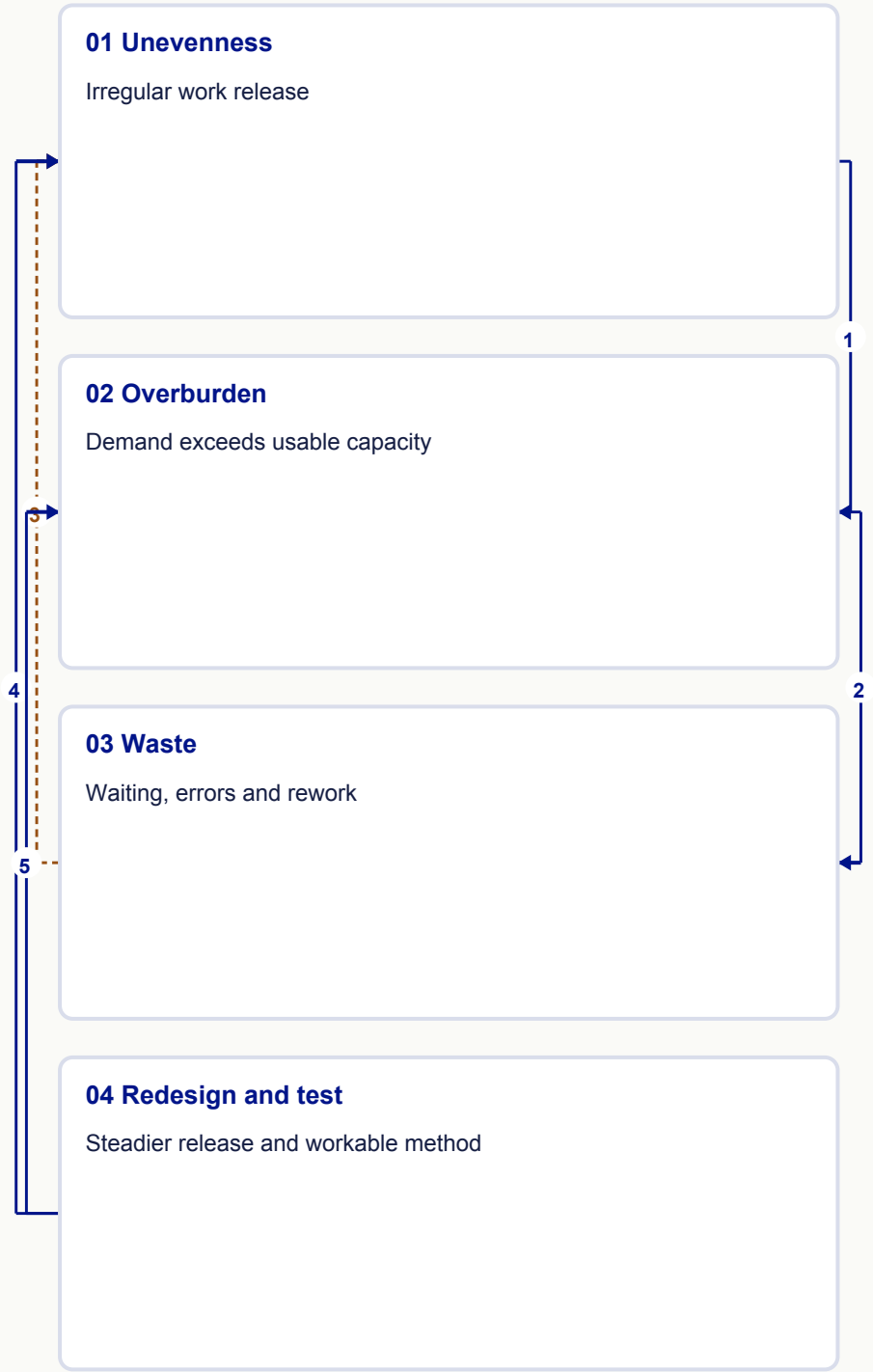
Eligibility at one operation does not remove a separate missing-component dependency.

What would change the decision?

A release record exists; the shipment record remains 68 until complete sets are actually delivered.

See how the method works

A weekly release surge can make people hurry, create errors and leave others waiting later. Those are connected observations, not three unrelated improvement projects. Ask how work arrives, what capacity is available, and where the method demands unreasonable effort. Then redesign the release or work arrangement with the people affected. A short pause may protect reliability; eliminating it without understanding the system can worsen the outcome. Compare customer service, workload and quality after the change. The aim is an easier, steadier method that removes avoidable waste without transferring burden elsewhere.



Read every connection

1. Step 1 > 2
Surges

2. Step 2 > 3
Disruption

3. Step 3 > 1
Unreliable completion

4. Step 4 > 1
Reduce variation

5. Step 4 > 2
Respect capacity

Connected method map: Unevenness, Overburden, Waste, Redesign and test. Every authored connection is shown with a numbered arrow and named legend.

04 / Test a steadier release with safeguards

The release owner proposes 20 complete requests daily, retaining necessary readiness checks. The team verifies that the information is available and the service promise allows immediate release.

Why: Leveling a controllable internal release may reduce induced overload. It does not mean holding urgent customer work to make a graph smooth.

Evidence / check: Proposed daily load 20 versus capacity 25; five-request nominal margin, not guaranteed spare capacity.

05 / Check all three conditions after the trial

Record waiting, repeat work, completion accuracy and experienced workload. Keep time for problem solving and response coverage rather than filling every quiet minute with more starts.

Why: Removing visible idle time can remove the ability to absorb normal variation and then recreate overload elsewhere.

Evidence / check: Trial review compares daily patterns, queues and worker feedback with the original mechanism.

Completed release diagnosis

Mechanism	Case evidence	Response
Mura	Friday-only internal release	Check daily release feasibility
Muri risk	100 released against 25/day	Do not demand an impossible daily rate
Muda candidates	Clarification and corrections	Observe causes and frequency
Prediction	20 ready requests/day	Check accuracy, age and sustainable workload

The customer actually sends a Friday surge

A new observation shows 80 requests arrive on Friday and only five on each earlier weekday.

Decision

Reopen the demand and capacity assumptions; do not pretend the release manager created all the unevenness.

Reasoning

The same visual symptom can have a different cause. Options may include agreed lead times, flexible trained capacity or readiness changes, subject to customer needs.

What would change the decision?

Separate arrival and release histories support the revised explanation.

See how the method works

Use three clocks to avoid three different questions becoming one number. Takt expresses the demand interval over a declared available period. Cycle observations describe how a process actually repeats, including its variation. Lead time follows one order through work and waiting from an agreed beginning to an agreed end. In this exercise, 400 available minutes for 300 units gives an 80-second takt. That is a planning reference, not proof that every task can safely be performed in 80 seconds. Investigate gaps in method or capacity and verify the effect on customer elapsed time.

Takt

Available time / customer demand

400 min x 60 / 300 units = 80 seconds per unit. Demand sets the reference.

Cycle time

Observe the actual repeating interval

Observe the repeating completion interval at a defined process. No cycle-time observation is supplied in this example.

Lead time

Follow one item through work and waiting

Follow one item from the declared start to finish, including queues and waiting. No elapsed lead-time observation is supplied.

Method exhibit: Takt, Cycle time, Lead time.

Completed timing definitions - missing values retained

Field	Result	Meaning
Available time	24,000 sec/day	Declared net time
Demand	300 units/day	Same period
Takt	80 sec/unit	Required rhythm
Cycle	Not measured	Repeated process-event observation needed
Lead time	Not measured	Identified order start and finish needed

A second plan uses gross time

Another planner supplies 450 minutes including 50 minutes of planned nonproduction time for the same 300 units.

Decision

Use 450 minus 50 = 400 net minutes; the takt stays 80 seconds per unit.

Reasoning

Dividing gross time would give 90 seconds and imply more productive time than the plan provides.

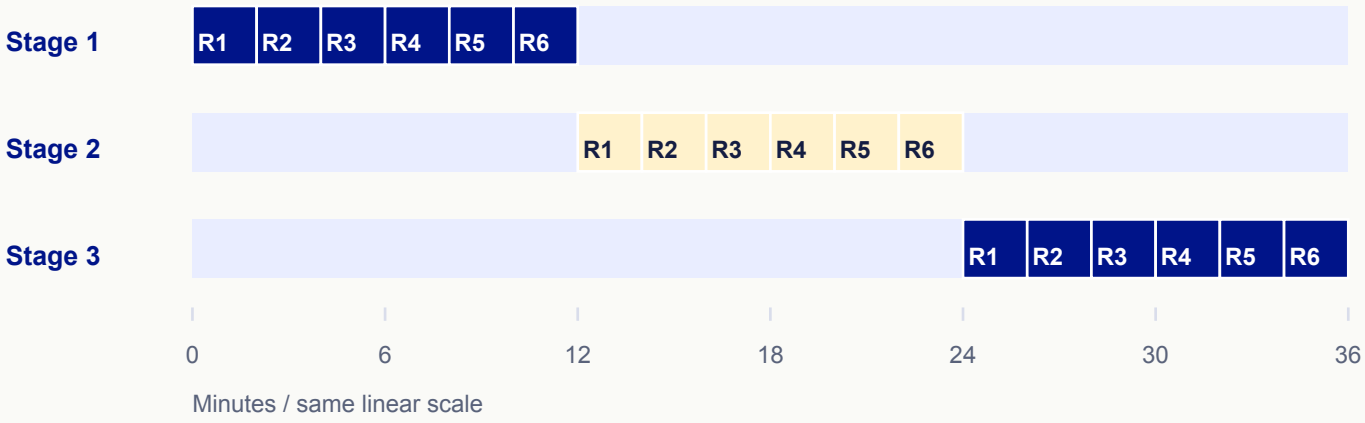
What would change the decision?

Both versions reconcile to 24,000 net seconds.

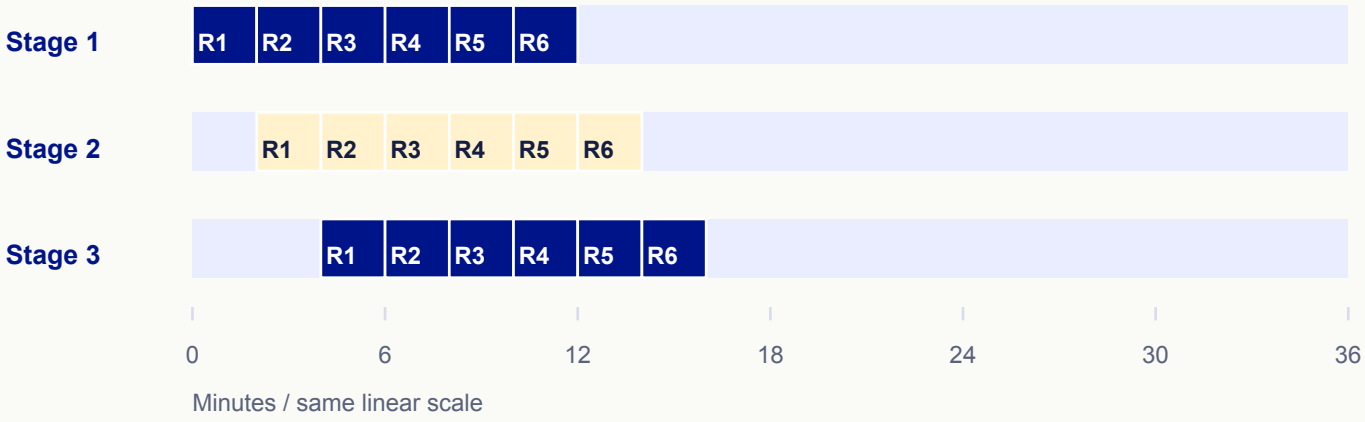
See how the method works

Keep the amount of work identical when comparing transfer policies. Six requests require three two-minute operations, performed by three dedicated workers. With transfer batches of six, the first request completes at minute 26 and the last at 36. With immediate transfer of each request, those times become 6 and 16. Both arrangements contain 36 person-minutes of work. The improvement comes from overlap between stages and less waiting for a batch to fill. Real processes also have travel, setups, variation and quality checks; include those before promising this theoretical result at work.

Transfer six - first 26 min; last 36 min



Transfer one - first 6 min; last 16 min



Same labor: 36 person-minutes in each case.

Three dedicated workers, one per stage; All requests available at time zero; Two minutes at each stage; No setup, travel, variation or rework.

Method exhibit: Transfer six, Transfer one, Same labor.

04 / Reconcile elapsed and labor quantities

Sum all 18 two-minute tasks in each schedule: 36 person-minutes. Compare the first and last completion separately instead of calling 20 saved elapsed minutes a labor saving.

Why: The model reduces waiting through overlap. It does not remove a task or prove fewer people are needed.

Evidence / check: First completion improves by 20 min and final completion by 20 min; person-work is unchanged.

05 / Plan the real-world test

Check transfer feasibility, information completeness, quality feedback and worker access before trying smaller batches. Record any extra transfer work or interruptions in the actual trial.

Why: The clean simulation omits conditions that may change the result. Small transfers are useful hypotheses, not permission to ignore safety or necessary processing batches.

Evidence / check: Trial compares completion distribution, rework and actual work content under a declared staffing arrangement.

Completed transfer comparison

Measure	Batch of 6	Transfer each request
Stage 1 occupied	0-12 min	0-12 min
R1 at stage 2	12-14 min	2-4 min
R1 complete	26 min	6 min
R6 complete	36 min	16 min
Person-work	36 person-min	36 person-min

The second stage cannot receive individual requests

A required approved process accepts only a validated processing batch. No alternative has yet been qualified.

Decision

Do not assume one-piece processing is feasible. Investigate smaller transfer batches before and after the required batch, subject to the real process constraints.

Reasoning

Processing batch and transfer batch are different decisions; the numerical one-piece result no longer describes this route unchanged.

What would change the decision?

Mark the required batch boundary and recalculate a feasible schedule before claiming a gain.

See how the method works

The two signals answer different questions. A withdrawal signal authorizes the material handler to convey a defined quantity to the consuming process. Removing that quantity from the supermarket returns a production signal, authorizing replacement. Keep item identity, quantity and destination attached to the loop. Follow one container through both actions and check that cards cannot silently multiply. The drawing should distinguish material movement from information returning upstream. This is a physical replenishment mechanism; a board that merely displays tasks does not automatically implement the same control. Investigate missing signals and quality holds before replenishing blindly.

Read every connection

1. Step 1 > 2
Replenished material

2. Step 2 > 4
Full container

3. Step 4 > 3
Delivered material

4. Step 3 > 4
Withdrawal kanban

5. Step 4 > 2
Authorize withdrawal

6. Step 2 > 1
Production kanban

Connected method map: Producing process, Supermarket, Consuming process, Material handler. Every authored connection is shown with a numbered arrow and named legend.

05 / Close the trace and expose the exception

Maya records delivery to C2 and the producer records replacement completion. The leader assigns the C23 hold to quality and tracks the effect on eligible supply separately.

Why: A reconciliation makes missing or duplicate cards visible. Hiding the hold with extra inventory would conceal the response problem.

Evidence / check: W04 fulfillment and P21 completion are linked; P22 stays with C22 and P23 stays controlled with C23.

Completed signal and container trace - fictional example

Event	Material/status	Authorization / decision
1. Request	C2 begins its current container	W04 requests 12 B17
2. Exchange	C21 eligible; C23 held	W04 onto C21; P21 returned
3. Convey	C21 delivered to C2	One withdrawal fulfilled
4. Replenish	One replacement: 12 verified B17	P21 permits make; no extra 36
5. Reconcile	C22 eligible; C23 still held	P22/P23 remain accounted for

The selected container is held at the last check

Before exchange, quality changes C21 to HOLD. C22 is still verified and the same item/quantity.

Decision

Use C22 only after checking its status; return P22, not P21. Keep C21/P21 under the hold procedure and record the changed selection.

Reasoning

The replenishment trace must follow the container actually withdrawn. Swapping cards casually would create false stock and production records.

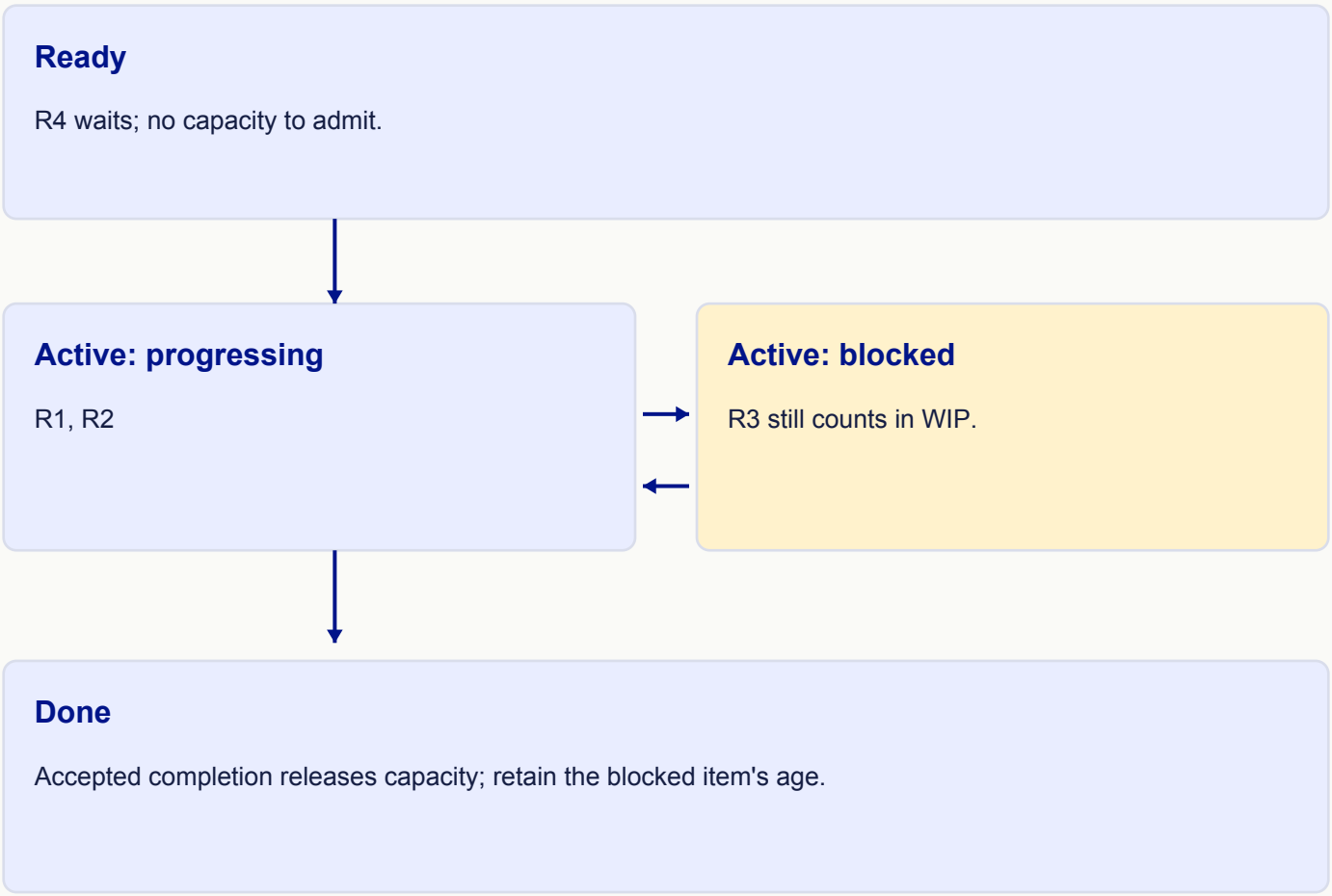
What would change the decision?

The revised trace names W04, C22 and P22; C21 has no delivery event.

See how the method works

A request board becomes useful when the team agrees what may enter active work, what completion means and what to do when progress stops. Begin with a provisional capacity limit, not a supposedly universal number. Keep blocked requests visible and counted so that the limit reflects real commitments. Review old work and remove obstacles before admitting more. A limit can expose a dependency that another team must help resolve. Judge the experiment by completed service, elapsed time and rework, not by how many tickets moved between columns. Urgent work needs an explicit exception policy.

Active WIP 2 + 1 blocked = 3 / limit 3



Ready > Active: Admit only with capacity
Active > Blocked: Blocked condition
Blocked > Active: Obstacle resolved
Active > Done: Verify done

A pull board keeps progressing and blocked work visible within the active limit. Labelled paths connect real completion to the next permitted start.

04 / Admit the next eligible request visibly

When R1 is actually completed and its acceptance evidence recorded, the active count falls to two. The team then pulls R4 using its agreed ready-queue ordering rule.

Why: The release is linked to a real exit event, not to optimism that someone will finish later.

Evidence / check: R1 completed; R2 and R3 remain active; R4 admitted; count returns to three.

05 / Review the rule and recurring constraint

Record blocked age, completion rate and any exceptions over a representative period. If approval delays repeatedly occupy the limit, address that dependency with its owner.

Why: A board alone cannot remove a cross-team response failure. Changing the limit needs an explicit learning decision, not a hidden workaround.

Evidence / check: A review record names the recurring approval cause and a test of response reliability.

Completed admission and blocker record

Event	Active count	Decision
Initial review	3 of 3	R4 remains Ready
R3 blocker check	3 of 3	Owner and next contact visible
R1 accepted complete	2 of 3	One genuine slot opens
R4 pulled	3 of 3	R2/R3/R4 active
R3 moved off-screen only	Still 3 of 3	No new authorization

An urgent request cannot wait for the normal rule

An authorized service owner declares R5 urgent under the existing exception policy while all three slots remain occupied.

Decision

Use the documented exception: name its approver, identify which commitment changes, record the temporary count and set a review/exit condition.

Reasoning

Urgency may justify a controlled exception; hiding an extra start prevents the team from seeing its cost or restoring the normal limit.

What would change the decision?

Exception record identifies R5, approval, temporary WIP and displaced work.

See how the method works

Level both volume and mix over a useful planning horizon. The exercise has 400 available minutes and demand for 300 units, giving an 80-second takt. Six units make an eight-minute pitch. Fifty packs therefore fill the horizon. Repeating AABAB ten times releases 30 A packs and 20 B packs: 180 A units and 120 B units. The box makes the next release and any missed interval visible. Before trialing this pattern, verify changeover time, capacity and actual demand. A tidy repeating schedule is not permission to produce items that are no longer needed.

80 s takt x 6 units = 8 min pitch

Read each row left to right: one complete A A B A B pattern.

0-40 min	**A / 6**	**A / 6**	**B / 6**	**A / 6**	**B / 6**
40-80 min	**A / 6**	**A / 6**	**B / 6**	**A / 6**	**B / 6**
80-120 min	**A / 6**	**A / 6**	**B / 6**	**A / 6**	**B / 6**
120-160 min	**A / 6**	**A / 6**	**B / 6**	**A / 6**	**B / 6**
160-200 min	**A / 6**	**A / 6**	**B / 6**	**A / 6**	**B / 6**
200-240 min	**A / 6**	**A / 6**	**B / 6**	**A / 6**	**B / 6**
240-280 min	**A / 6**	**A / 6**	**B / 6**	**A / 6**	**B / 6**
280-320 min	**A / 6**	**A / 6**	**B / 6**	**A / 6**	**B / 6**
320-360 min	**A / 6**	**A / 6**	**B / 6**	**A / 6**	**B / 6**
360-400 min	**A / 6**	**A / 6**	**B / 6**	**A / 6**	**B / 6**

10 repeats: A 180 + B 120 = 300 units in 400 min

Each cell is one six-unit release. Mix remains wanted; changeover, capacity and quality feasibility must be checked.

Method exhibit: Daily mix, Pitch, A A B A B, Repeat ten times.

04 / Check whether the release can be performed

The team checks changeovers, equipment response, staffing, material readiness and first-piece acceptance against the proposed sequence. It records missing capability data instead of assuming eight minutes is available for any amount of work.

Why: Leveling depends on operating conditions. A visually level board does not absorb unmeasured setup losses or make unavailable material eligible.

Evidence / check: Feasibility review names the changeover owner and required timing/quality evidence.

05 / Respond to actual demand and abnormality

Record plan versus eligible completion by pitch and make exceptions visible. Review the pattern when demand or pack size changes; preserve the approved quality response when a pack cannot be completed.

Why: Heijunka is not permission to make an obsolete mix simply to fill every box. The pattern serves customer demand.

Evidence / check: A missed pitch has a cause and response; it is not silently filled with another unwanted product.

Completed first-pattern and daily reconciliation

Item	Packs	Units / time
Slots 1-5	A, A, B, A, B	18 A + 12 B; 40 min
Ten patterns	50 packs	300 units; 400 min
Daily A	30 packs	180 units
Daily B	20 packs	120 units
Capability	Not demonstrated	Observe changeovers and quality

The requested mix changes

Confirmed demand becomes 150 A and 150 B, still totaling 300.

Decision

Rebuild the mix pattern; retaining the old pattern would make 30 excess A and leave 30 B short.

Reasoning

The unchanged total and takt do not make the old product sequence correct.

What would change the decision?

New plan reconciles each product separately before release.

See how the method works

Connect adjacent work directly when the process can safely support it. When that is not feasible, make the waiting mechanism explicit. A bounded FIFO lane preserves arrival sequence and creates a clear response when full. A supermarket holds defined quantities of repeat items and replenishes what is consumed. Neither is a license for unlimited stock. Consider product variety, required sequence, replenishment reliability and quality status before choosing. In custom administrative work, a finite sequenced queue may be more useful than pretending every possible request can be stocked. Review end-to-end delay after the connection changes.

Connected method map: Can work flow directly?, Direct flow, If not, choose a connection, Bounded FIFO, Supermarket. Every authored connection is shown with a numbered arrow and named legend.

04 / Write the full or blocked response

When all four FIFO positions are occupied, upstream does not put a fifth item beside the lane. The owner checks downstream blockage and follows an explicit release/exception rule. A held item retains its quality status.

Why: The limit loses meaning if overflow is hidden. Sequence and eligibility are separate; a local rule must govern any held item rather than silently bypassing it.

Evidence / check: Full-lane record names the blocked handoff, owner and next review time.

05 / Test the selected connection

Observe demand, WIP, waiting age, stockouts and quality after a limited trial. Keep alternative connection choices open if product variety or process constraints change.

Why: The diagram is a design decision based on observed conditions, not a permanent label attached to a department.

Evidence / check: Connection review links the choice and limit to actual operating evidence.

Completed connection decision

Route	Provisional control	Required response
Assembly/test	Direct flow	Do not hand into an unready/unsafe process
Custom nameplates	FIFO, trial limit 4	Stop ordinary release at full lane
Repeat fasteners	Supermarket candidate	Replenish defined consumption
Generic overflow rack	Rejected	No bounded authority or sequence

A FIFO item is on quality hold

The first custom nameplate becomes held while the other three positions remain occupied.

Decision

Retain identity and hold status, notify the owner and apply the approved hold/sequence rule; do not assume moving it away opens an ordinary release slot.

Reasoning

Physical movement, eligibility and commitment are different facts. The response must preserve all three.

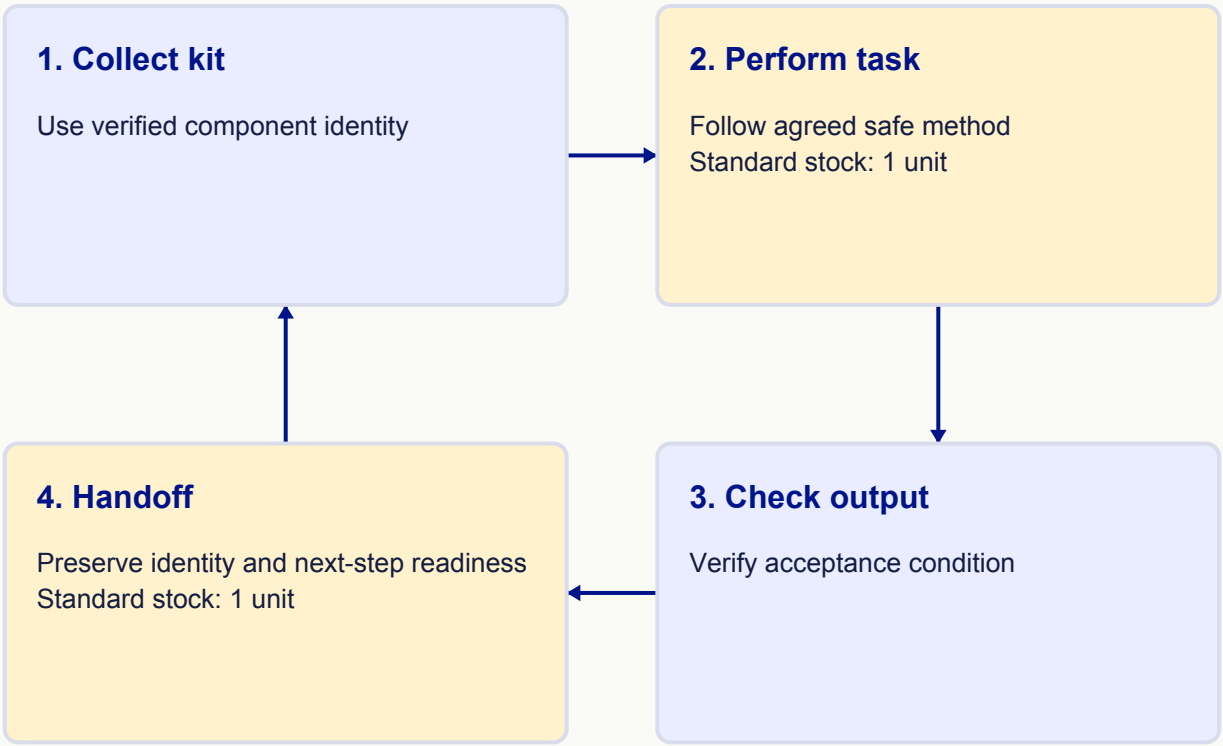
What would change the decision?

Hold disposition and any authorized resequencing are traceable.

See how the method works

A production standardized-work chart combines the demand reference, operator sequence and required in-process stock on the physical layout. It makes the agreed method visible where work occurs. Observe the current method first, agree a safe sequence with the team and mark the inventory needed for the cycle to function. Then trial the arrangement and revise the chart when learning changes the method. A written instruction can explain an operation in detail but may omit these relationships. The chart is an improvement baseline, not evidence that variation has vanished or that faster work is automatically safe.

Takt reference 80 s | standard WIP 2 units



Arrows show the operator route, including return from handoff to kit. Positions are schematic, not a measured floor plan.

Two-unit stock and layout are fictional teaching settings; task/capacity feasibility is not validated.

The workplace route connects kit, work, check and handoff positions, including the return path. Declared stock positions and timing fields remain visible.

04 / Compare the drawing with one actual cycle

Observe the agreed method with the operator under local rules. Record any extra reach, waiting, travel or stock needed to sustain it; do not alter the workplace solely to match the poster.

Why: The chart is a baseline for learning. A mismatch is evidence to investigate with the person doing the work.

Evidence / check: Observation sheet records discrepancies and their operating condition; no achieved cycle value is invented.

05 / Control the revision and teaching

If a trial changes a location or sequence, revise the chart, timing evidence and affected instruction together. Coach the new method and verify understanding before retiring the old version.

Why: An attractive new drawing cannot establish competence or prove the layout feasible.

Evidence / check: Revision owner, effective condition and observed operator demonstration are recorded.

Completed chart audit

Required item	Included value	Audit result
Takt	80 sec/unit	Planning reference
Cycle	Not measured	Observation required
Sequence	1 > 2 > 3 > 4 > 1	Return route retained
Standard stock	Work 1; Handoff 1	Total 2 units
Quality	Check before handoff	Acceptance criteria referenced

Handoff is moved behind the bench

A proposal moves Handoff to a new position and adds a return walk not shown on the original chart.

Decision

Mark the proposed route separately, observe the added movement and reassess timing, access and stock.

Reasoning

The old chart's arrows and assumptions no longer represent the proposed method, even though the four step names are unchanged.

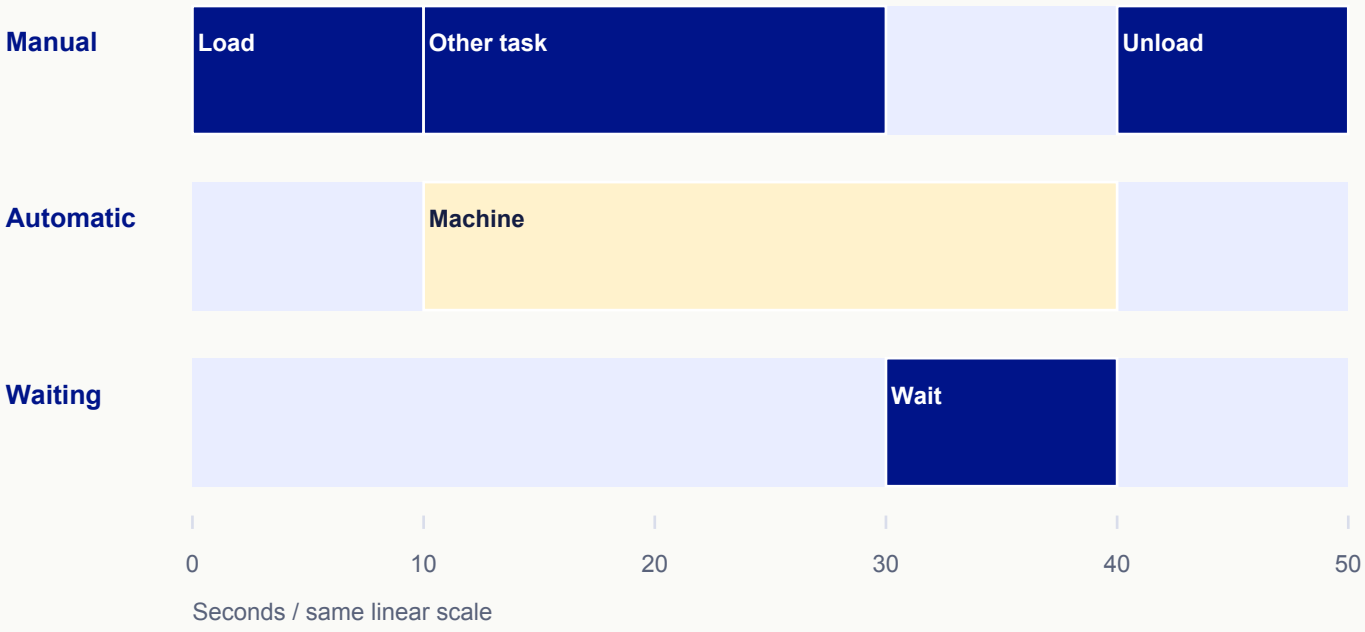
What would change the decision?

Before/proposed drawings and measured route evidence accompany the review.

See how the method works

An operator balance chart totals work, but it can hide when automatic processing overlaps manual activity. A combination table puts those activities on a shared time axis. Distinguish hands-on time, walking and automatic machine time, then trace the actual sequence. Check when the person is free, when a machine requires attention and where waiting occurs. Do not add all machine time to labor content or assume that any apparent overlap is feasible. Safe access, sequence and quality requirements remain binding. Use repeated observations and trial the proposed pattern with the operator before revising the method.

Observe overlap, not the sum of all lane durations



Lane	Element	Interval
Manual	Load	0-10 s
Manual	Other task	10-30 s
Manual	Unload	40-50 s
Automatic	Machine	10-40 s
Waiting	Wait	30-40 s

Manual 40 s; automatic 30 s; elapsed 50 s. Overlap is a hypothetical permitted arrangement; access, precedence, quality and task availability require validation.

Method exhibit: Load, Automatic cycle, Separate manual task, Wait / observe, Unload.

05 / Record an observed alternative distinctly

When a trial supplies different times, redraw the intervals from those observations and compare the full sequence. Retain the original supplied model as a prediction.

Why: A work-content total alone does not show the repeatable output interval, especially where machine and operator cycles interact across units.

Evidence / check: Actual trial timings and operating conditions accompany any proposed standard revision.

Completed resource-time reconciliation

Quantity	Calculation	Result
Manual work	10 + 20 + 10	40 sec
Automatic process	40 minus 10	30 sec
Operator waiting	40 minus 30	10 sec
Elapsed sequence	50 minus 0	50 sec
Incorrect sum	40 + 30	70 sec double-counts overlap

The separate task takes longer

In a hypothetical variant the separate task takes 35 seconds, starting at second 10.

Decision

It ends at 45, five seconds after the machine. Unloading is then 45-55 if all access assumptions still hold.

Reasoning

There is no operator wait before unloading; the machine instead waits five seconds. The original 50-second sequence no longer applies.

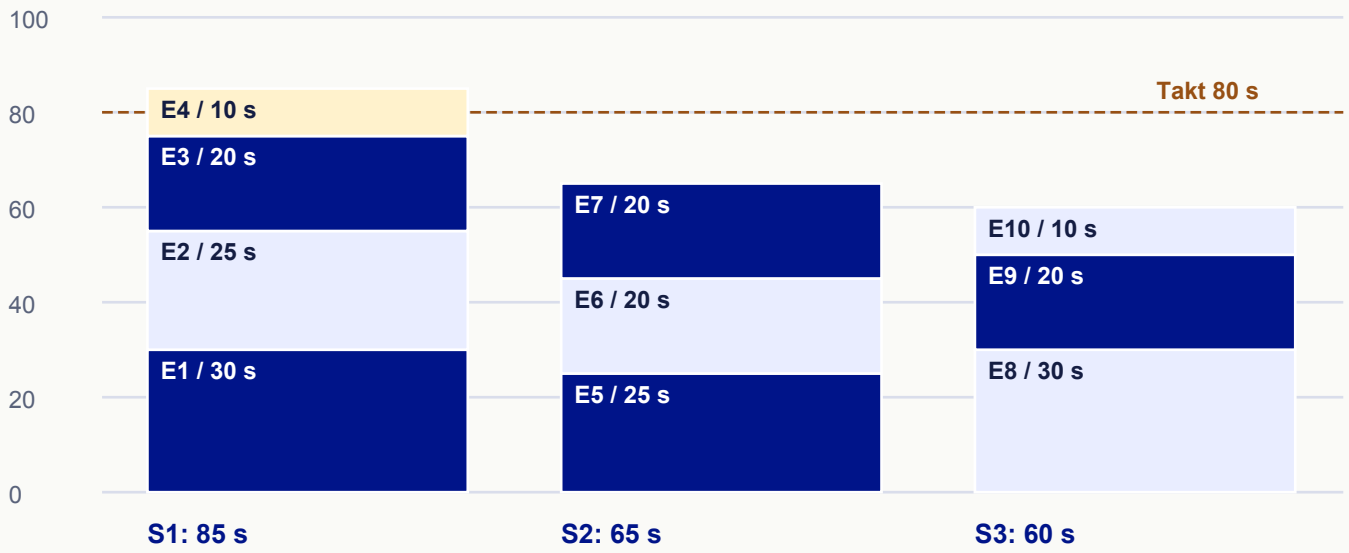
What would change the decision?

Manual content 55 sec; automatic 30 sec; elapsed 55 sec; machine wait 5 sec.

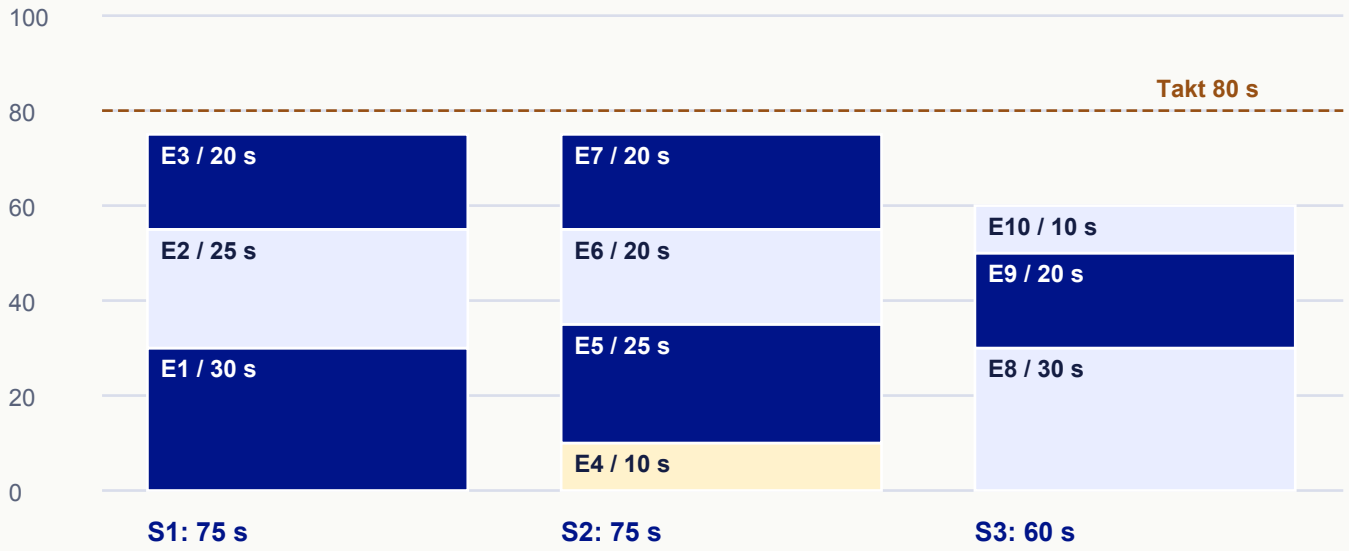
See how the method works

Build each bar from observable work elements so a proposed change remains traceable. Here, operator work content is 85, 65 and 60 seconds against an 80-second takt. Moving E4, the ten-second empty-tote return, from operator one to operator two produces 75, 75 and 60 seconds. Total work remains 210 seconds. This is a theoretical redistribution, not a demonstrated new cycle. Check precedence, walking, skills, ergonomics, variability and machine overlap. The elements and their labels must stay visible in both views. Balanced bars can guide a trial; they do not by themselves justify a staffing decision.

Before / human work content (seconds)



Proposed / human work content (seconds)



Method exhibit: Before, Move E4, Proposed, Validate.

Completed allocation proposal - seconds of human work

Operator	Before elements / total	Proposed elements / total	Decision
1	E1 E2 E3 E4 /85	E1 E2 E3 /75	Release E4 to 2
2	E5 E6 E7 /65	E4 E5 E6 E7 /75	Receive E4 provisionally
3	E8 E9 E10 /60	E8 E9 E10 /60	No ownership change
All	210 sec	210 sec	Trial required; takt 80 sec

The route adds eight seconds

A hypothetical trial reveals that operator 2 needs 8 additional seconds of walking per unit to perform the tote return. This was absent from the supplied element model.

Decision

Update operator 2 to 83 seconds and total work to 218 seconds for this trial condition. Do not approve the original transfer unchanged; redesign access or test another authorized method.

Reasoning

83 exceeds 80-second takt by 3 seconds. Averaging the three operators together would conceal the local overload.

What would change the decision?

Record the extra walking as a new observed element, its timing basis and operating condition; retain the original proposal for comparison.

See how the method works

Observe the complete changeover boundary, including the point at which acceptable output is restored. Separate activities that require stopped equipment from preparation that can safely occur beforehand or elsewhere. Improve preparation first, then ask whether any internal activity can be redesigned as external work. Simplify the remaining steps without bypassing isolation, technical settings or quality checks. Keep the first-good-output verification in the new method. Record measured timing rather than treating reduced searching as the entire changeover gain. SMED names an ambition for single-digit minutes; it does not promise every process can change in one minute.

Before

1. Stop

Sequence only; no measured duration

2. Fetch approved kit

Sequence only; no measured duration

3. Controlled internal change

Sequence only; no measured duration

4. Verify first good output

Sequence only; no measured duration

Proposed

1. Prepare approved kit externally

External, before shutdown

2. Stop

Sequence only; no measured duration

3. Controlled internal change

Sequence only; no measured duration

4. Verify first good output

Sequence only; no measured duration

No duration or achieved reduction is claimed. Equipment isolation and first-good verification remain required.

Method exhibit: Before, External preparation, Internal work, First good output.

05 / Measure before claiming a gain

Observe representative before and trial changeovers using the same boundary, noting mix, staffing, missing items, adjustments and quality results.

Why: SMED is an improvement method; its name does not establish a measured result for this unmeasured example.

Evidence / check: No duration or percentage saving is reported until comparable records exist.

Completed before/proposed sequence review

Activity	Before	Proposed decision
Approved-kit preparation	After stop	Candidate external work before stop
Internal change	Stopped condition	Retain approved controls
First-good verification	After internal change	Retain acceptance evidence
Elapsed improvement	Unknown	Measure comparable runs
Missing kit item	Delay risk	Expose before stopping where feasible

The kit is incomplete at the readiness check

A required approved component is absent before the planned stop.

Decision

Escalate the readiness failure to the changeover owner and follow the approved production plan; do not substitute an unapproved component to protect a time target.

Reasoning

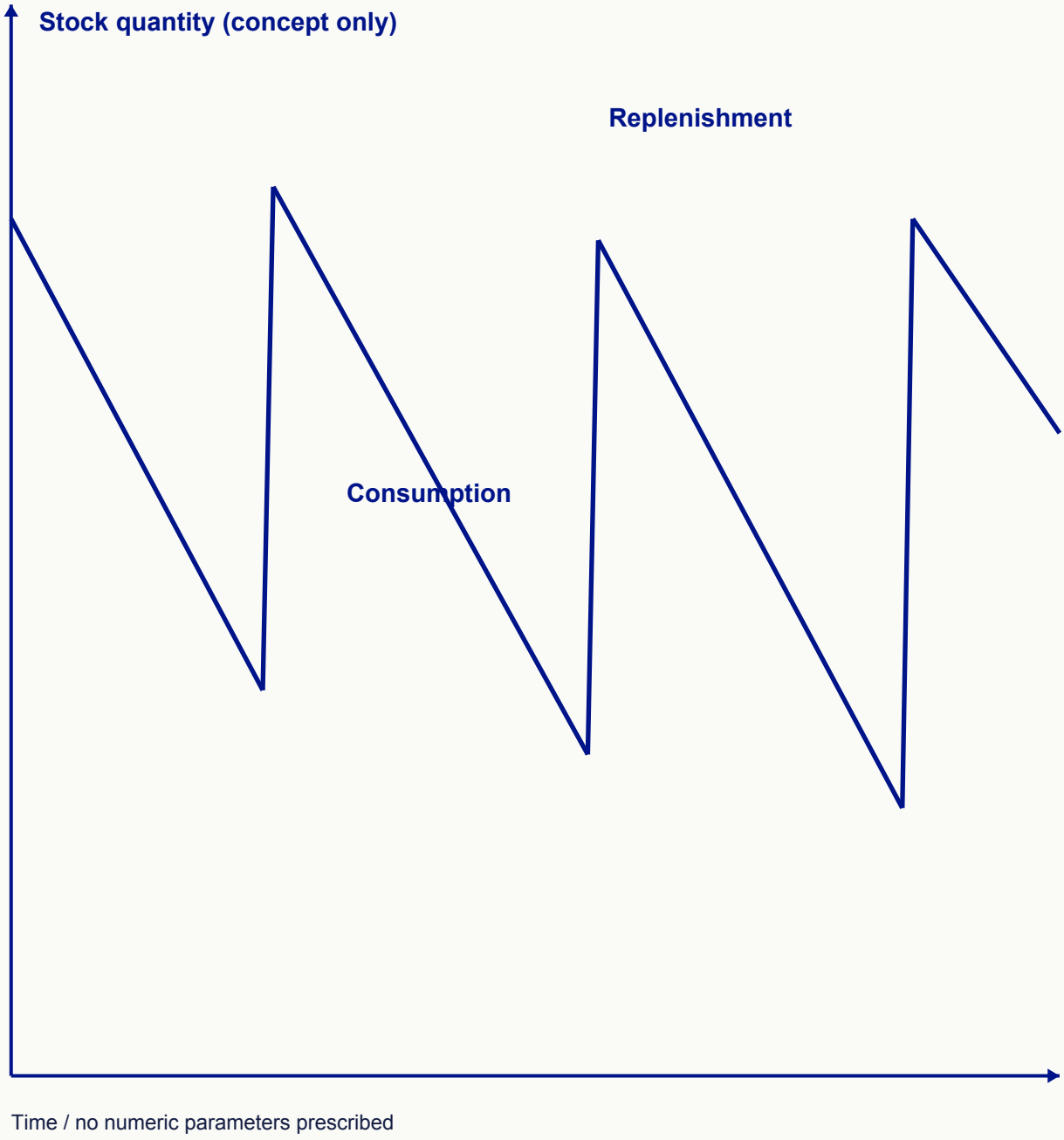
The earlier check has made the problem visible. It has not created authority to change the configuration requirements.

What would change the decision?

Missing item, owner, decision and revised plan are recorded.

See how the method works

Stock should protect a defined service need during replenishment, with assumptions that can be checked. Observe how quickly an item is used, how long a refill actually takes, and how variable both are. Check the accuracy of on-hand stock and outstanding orders before setting provisional bounds. Trial the rule, record shortages and excess, and adjust from evidence. Shelf space alone is not a demand model. Freshness, handling and supplier pack sizes may constrain the choice. Keep the previous pantry arithmetic as an example of a decision rule, not as universal settings for unrelated items or sites.



Conceptual stock depletion and replenishment over time; no numeric stock parameters are prescribed.

04 / State what remains needed for sizing

Agree the required service, review cycle, order constraints, freshness/space/handling limits and reliable stock records. Obtain representative consumption and delay evidence before selecting parameters.

Why: A stock policy trades availability against inventory and practical constraints. Shelf capacity alone answers only the physical storage question.

Evidence / check: Parameter decision remains open with named missing inputs and owners.

05 / Test and revise an approved policy visibly

Once the owner approves a bounded trial, record signal, on-order quantity, receipts, stockouts and aged stock. Investigate missed or duplicate signals before simply adding stock.

Why: A replenishment problem can come from inaccurate records or slow response, not only insufficient quantity.

Evidence / check: A learning record links any parameter change to service and inventory outcomes.

Completed stock and evidence review

Field	Reconciled result	Implication
Available now	30 cups	Do not include damaged/incoming
Incoming	40 cups	Track receipt and eligibility
Observed delay	2-4 working days	Nominal delay alone is insufficient
Consumption during delay	20 / 36 / 44 cups	Retain paired observations
Approved parameters	Not supplied	No safety-stock recommendation

The incoming order is delayed

Purchasing reports that the 40 cups will arrive later than confirmed; the usable count remains 30.

Decision

Update the expected receipt and communicate the service risk using the current usable stock and expected demand; apply the approved shortage response.

Reasoning

Changing a due date does not create stock. Do not quietly mark an order received to make the display look healthy.

What would change the decision?

Revised receipt expectation, communication owner and actual stock remain traceable.

See how the method works

A reliable material route depends on reliable item information. Record the part identity, point of use, storage address, consumption, pack size and replenishment timing in fields that have clear owners. Walk one item from storage to consumption and back through its empty-container or signal return. Resolve discrepancies between the record and the actual route before expanding the system. Keep handling restrictions and quality status visible. A clean spreadsheet can still be wrong; the team needs a routine for maintaining it after changes. The aim is dependable supply at the point of use, not transport activity for its own sake.

Read every connection

1. Step 1 > 2
Defines

2. Step 1 > 3
Defines

3. Step 1 > 4
Defines

4. Step 2 > 3
Full container

5. Step 3 > 4
Deliver

6. Step 4 > 3
Empty / signal

7. Step 3 > 2
Refill signal

Connected method map: Owned part record, Storage, Supply route, Point of use. Every authored connection is shown with a numbered arrow and named legend.

04 / Control the interim and approved change

Follow the approved discrepancy response while purchasing and the flow owner decide the valid packaging basis. If 16-piece packs are approved, revise the route's unit definition and quantity logic rather than silently calling a box 20 pieces.

Why: Neither the handler nor the software display should invent stock or authority. Rounding a replacement box count also requires review of stock and handling consequences.

Evidence / check: Interim supply instruction is explicit; approved revision is traceable to the packaging decision.

05 / Walk one replenishment after revision

Trace an authorized replenishment from its signal through pick, conveyance and receipt. Reconcile actual pieces and update the record only through the controlled owner.

Why: A corrected database row is insufficient if the old route card, labels or point-of-use expectations remain in use.

Evidence / check: Record and physical receipt agree for item, packaging, count, location and handling method.

Completed PFEP discrepancy record

Field	Finding	Required action
Part	P42 identity confirmed	Keep identity trace
Pack	20 recorded / 16 observed	Resolve supplier change
Three-box delivery	48 rather than 60 pieces	Communicate 12-piece gap
Dependent instructions	Route/card/location/handling	Review as one change
Closure	Not yet demonstrated	Trace one approved replenishment

The supplier confirms a short shipment instead

Investigation finds the approved package is still 20 pieces; the observed 16-piece boxes were short.

Decision

Use the shortage/nonconformance process and retain the approved 20-piece master record until an authorized packaging change exists.

Reasoning

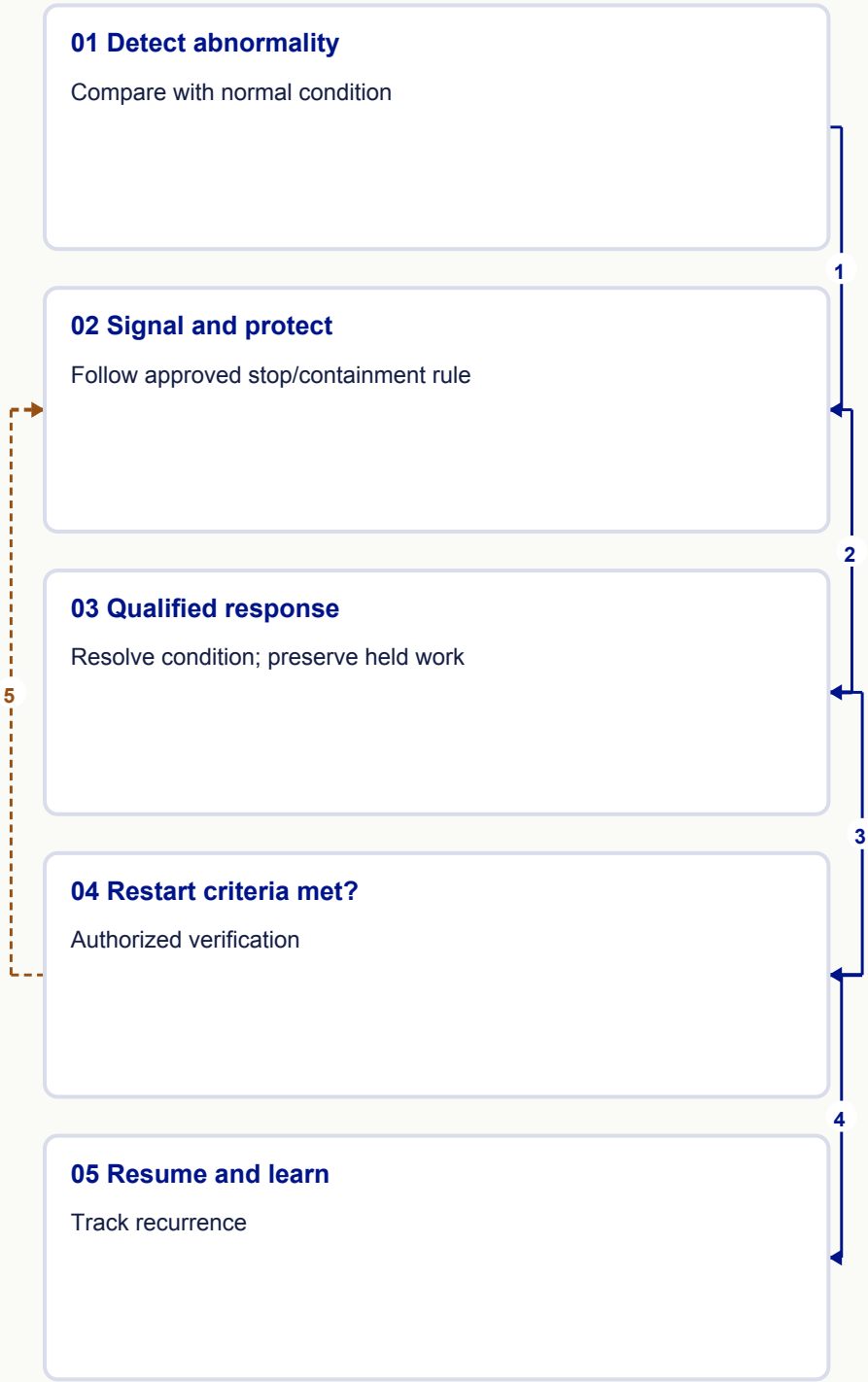
The same initial observation can lead to a different correction when its cause is known.

What would change the decision?

Supplier response and receipt discrepancy support the decision not to rewrite the pack definition.

See how the method works

Detection only protects customers when it triggers a response. Define the normal condition, the abnormality signal, who responds and what must be verified before work resumes. When a problem appears, follow the approved stop and containment rule so suspect work does not escape. The responding leader or specialist resolves the condition and confirms the restart criteria. Record recurrence for deeper investigation. Different processes have different stopping conventions; a fixed-position production stop is not an emergency-stop instruction. A red lamp without response ownership and follow-through merely displays the problem. The system must help people surface trouble early.



Read every connection

1. Step 1 > 2
Abnormal

2. Step 2 > 3
Request support

3. Step 3 > 4
Resolution evidence

4. Step 4 > 5
Yes

5. Step 4 > 2
No: hold continues

Connected method map: Detect abnormality, Signal and protect, Qualified response, Restart criteria met?, Resume and learn. Every authored connection is shown with a numbered arrow and named legend.

04 / Verify before restart

Check the prescribed process conditions and acceptance evidence, then record the authorized restart decision and the disposition of affected output. If criteria are unmet, continue the response.

Why: Reset, repair, verification and product disposition are separate events. None should be inferred from the display alone.

Evidence / check: Restart requires documented criteria met; V16-V18 remain controlled until disposition.

05 / Close the learning loop

Return the result to Leon and review recurrence, response delay and any weakness in detection or standard work. Update and teach approved changes through their owners.

Why: Without feedback, people may stop raising useful signals. The system should learn from the abnormality rather than reward silence.

Evidence / check: Operator feedback and a recurrence review are part of the completed response.

Completed abnormality-response trace

Stage	Evidence	Decision
Detect	V18 confirmation missing	Raise approved help signal
Contain	Last verified V15	Review V16-V18
Respond	Named quality/equipment owner	Investigate actual condition
Verify	Display reset only	Insufficient for restart
Learn	Response/recurrence record	Feed back to operator

The responder cannot attend immediately

The designated responder is unavailable and a production target is approaching.

Decision

Follow the approved escalation and safe-state procedure; the target does not create restart authority.

Reasoning

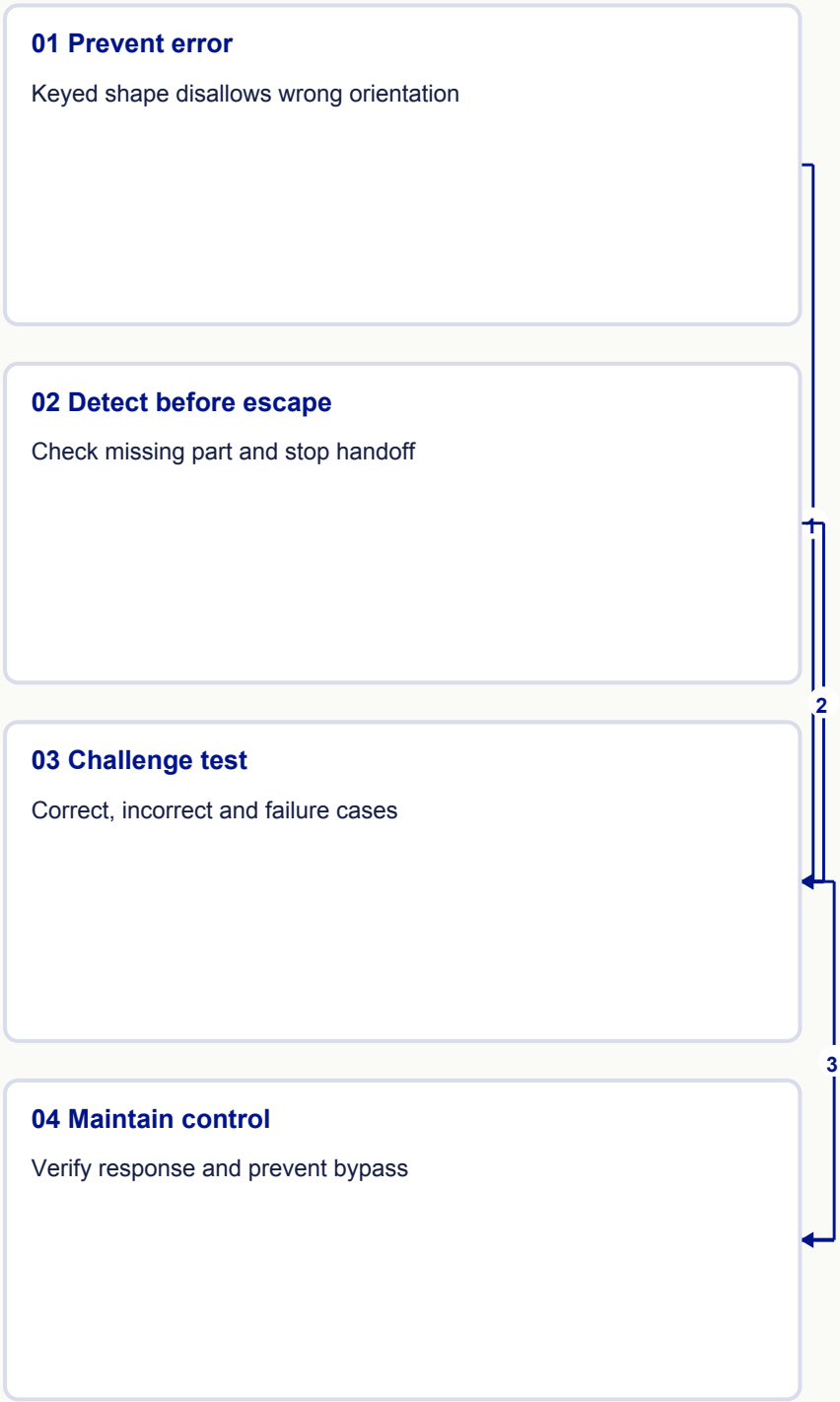
A missing response route is a system issue to expose, not a reason to substitute unverified output.

What would change the decision?

Escalation owner, current state and next contact are recorded.

See how the method works

Start with a specific error mechanism rather than a general request to be more careful. A keyed shape can prevent an incorrect orientation; a detection device can identify a missing part before it passes downstream. These are different levels of protection. Challenge the proposed control with known correct and incorrect cases, including plausible failure or bypass conditions. Define what happens when the check fails and who maintains the mechanism. A warning that people can overlook is not equivalent to physical prevention. Preserve required technical approval and verify the effect on quality before making the control part of the standard method.



Read every connection

1. Step 1 > 3
Validate

2. Step 2 > 3
Validate

3. Step 3 > 4
Accepted control

Connected method map: Prevent error, Detect before escape, Challenge test, Maintain control. Every authored connection is shown with a numbered arrow and named legend.

04 / Verify the response to control failure

Check that a failed or uncertain result leads to the required controlled state and named response, rather than a silent pass. Confirm reset/restart behavior through the approved method.

Why: A detector that can fail unnoticed may provide false confidence. An audible warning alone may not prevent escape.

Evidence / check: Fault/uncertain-state row includes containment, response owner and acceptance decision.

05 / Maintain the control and its scope

Document the validated failure modes, challenge frequency and change triggers. Recheck after relevant product, fixture, software or maintenance changes.

Why: A successful initial test does not make the control permanent or universal. The operational standard must retain the challenge method and response.

Evidence / check: Control owner, approved test record and scope limitations accompany release.

Completed mechanism and validation review

Item	Assessment	Required evidence
Keyed geometry	Prevention candidate	Wrong orientation cannot be assembled under approved conditions
Sensor + block	Detection/control candidate	Wrong orientation reliably stops release
Correct parts only	Insufficient challenge	Test defined incorrect conditions
Missing/wrong model	Separate failure modes	Assess control scope
Fault response	Not yet demonstrated	Verify controlled state and response

The sensor loses power

A fault test shows the sensor has no valid result after power loss, yet the proposed release signal remains permissive.

Decision

Do not approve the claimed detection control; the owner must correct and revalidate the fault response.

Reasoning

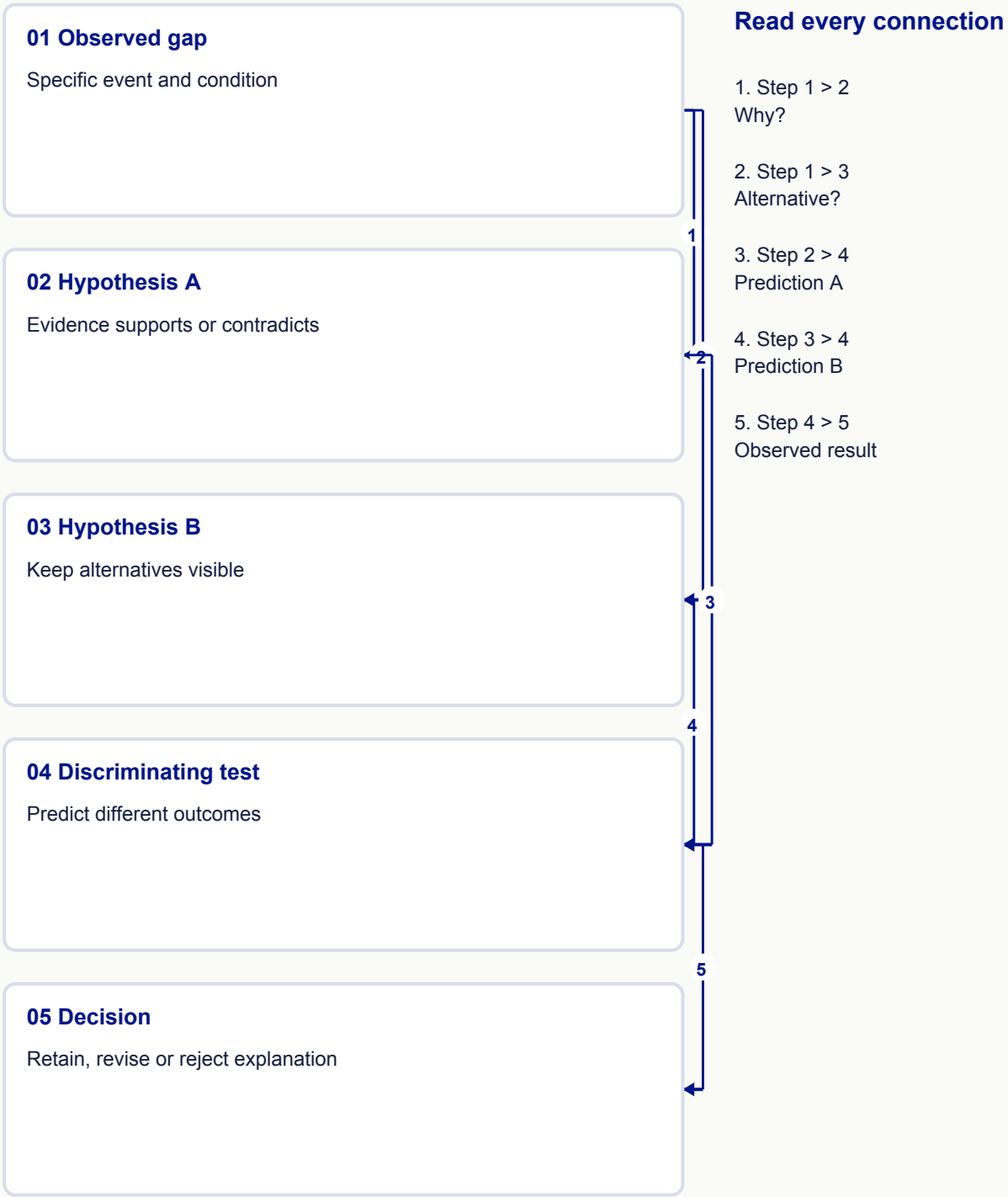
A normal-operation success cannot compensate for a known escape path in the tested fault condition.

What would change the decision?

Fault case recorded as failed, with affected claim and required retest.

See how the method works

Begin with a specific observed gap. For each proposed cause, ask what evidence supports the link and what observation would contradict it. Keep alternative explanations visible when the evidence branches. The number of questions is less important than reaching a cause that can be tested and acted on. Do not stop at a label such as human error, and do not invent certainty to complete a chain. A countermeasure should change the mechanism and be checked for effectiveness. Complex interacting variables may require another analysis method. The diagram supports disciplined reasoning; it is not proof by itself.



Connected method map: Observed gap, Hypothesis A, Hypothesis B, Discriminating test, Decision. Every authored connection is shown with a numbered arrow and named legend.

04 / Follow the result instead of the form

If the portal rejects an empty attachment, revise the entry hypothesis rather than adding more unsupported whys. If a trace loses a drawing, inspect that precise transition and test the proposed change.

Why: Contrary evidence narrows learning. A cause claim needs a verified mechanism and an effective response, not a filled chain.

Evidence / check: The completed planning record leaves results open and defines the next decision for each outcome.

Completed hypothesis/test plan - results not yet supplied

Claim	Test / expected distinction	Current status
A: omission accepted at entry	Submit empty training packet; acceptance supports A	Untested
B: attachment lost later	Trace identified attachment across handoffs	Untested
Staff inattention	No observation connecting it to event	Unsupported label
Next decision	Retain/revise claims from actual test results	No root cause established

Both mechanisms occur

In a fictional follow-up, one route permits an empty packet and another loses an attachment during conversion.

Decision

Keep two evidenced branches and their affected scopes; test responses for both. Do not force all events into the first explanation.

Reasoning

A recurring outcome may have multiple mechanisms.

What would change the decision?

Link each reproduced event to route, condition and observation; verify occurrence and escape controls separately.

See how the method works

First protect the operation when a current abnormality needs immediate attention. Then decide what kind of learning is required. Restoring a known condition differs from investigating a recurring gap, reaching a better future condition or exploring a new service. The four examples help choose proportionate effort, ownership and cadence. A large project template can slow a simple response, while a quick fix can leave a systemic cause untouched. Revisit the choice as evidence develops. Methods such as A3, DMAIC or experiments should support the problem, not become rituals imposed on every situation regardless of need.

Which learning question fits this situation?

Restore

Is an approved normal condition already known?

Restore it within authority; record what disrupted it.

Close standard gap

Does the same gap recur against an existing standard?

Investigate causes and verify a durable response.

Reach new condition

Is the present standard met, but a better target is needed?

Use bounded experiments toward the next condition.

Explore new value

Is the new value or service still uncertain?

Test assumptions with users before committing a solution.

A situation may need immediate restoration and a separate investigation. Choose deliberately.
Method exhibit: Restore, Close standard gap, Reach new condition, Explore new value.

Completed routing record - one team, four learning needs

Situation	Initial route	Next evidence / owner
Active 90-minute routing failure	Restore known condition	Duty lead: verify acknowledgments and affected queue
Fourth Monday recurrence	Investigate gap from standard	Process owner: stratify incident timing and test explanations
Reduce 1 hour to 30 minutes	Work toward a target condition	Improvement owner: observe current steps and trial
Unformed new service	Explore new customer value	Service designer: test need and feasibility

The standard is missing

A fifth complaint concerns a request type whose promised response time is disputed. Sales says one day; operations has no approved definition or time basis.

Decision

Clarify the customer commitment and operating definition with the responsible owner before labeling the team below standard. Address the live customer need while gathering facts.

Reasoning

A gap cannot be measured against an invented or ambiguous reference. Clarification may reveal a performance gap, a target discussion or a service-design problem.

What would change the decision?

Retain the promise, request type, time basis and who can resolve the standard; revise classification only after this is clear.

See how the method works

A broad complaint rarely gives a team enough direction to test a cause. Define what counts as the problem, over what period and out of how many opportunities. Break comparable observations down by useful factors such as request class, location or shift. Distinguish large counts from high rates. Then observe where the concentrated gap occurs and choose an analysis method suited to its mechanism. A ranking can guide attention but cannot establish causation. Keep reopened work and exceptions within the declared boundary so that an apparent improvement does not simply move the problem out of the measure.

Team	Errors	Cases	Rate
A	20	1000	2%
B	10	100	10%

Compare definitions, case mix and period. The difference is a question to investigate, not a causal conclusion.

Method exhibit: Team A, Team B, Before interpreting.

Completed denominator-aware comparison

Team / measure	Calculation	Interpretation
A error-containing cases	20 / 1,000 = 2%	Higher count; lower observed rate
B error-containing cases	10 / 100 = 10%	Higher observed rate; smaller volume
Combined	30 / 1,100 = 2.73%	Weighted total, not mean of rates
Next breakdown	Case type and occurrence point	No cause assigned

The apparent team effect is mixed with case type

Further fictional records show B handles mainly exceptions and A mainly routine cases, but type-specific denominators have not yet been reconciled.

Decision

Do not rank team capability from the pooled rates. Obtain comparable within-type counts and examine the work conditions.

Reasoning

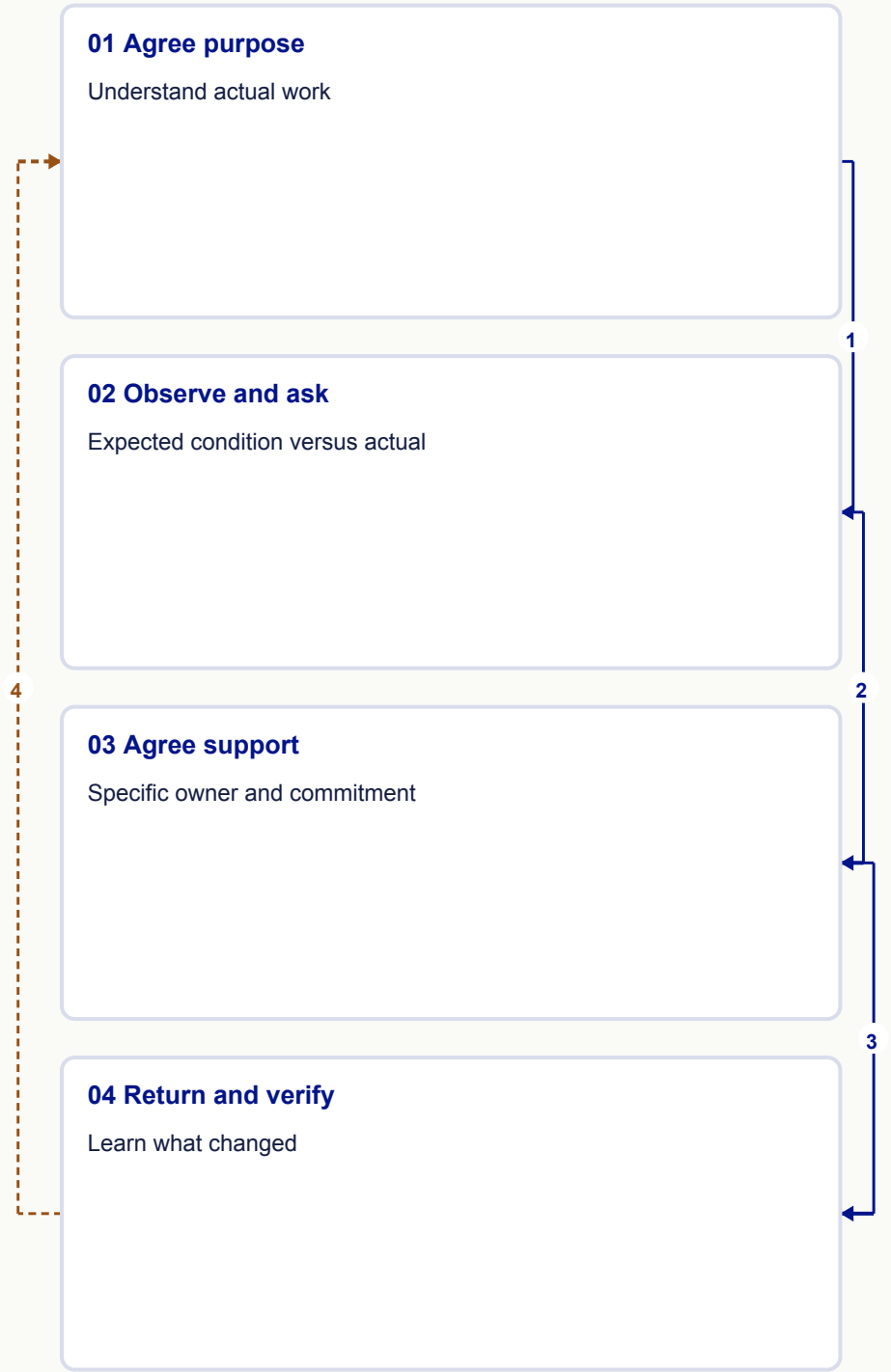
Case mix can change aggregate rates even when a named team is not the cause.

What would change the decision?

Retain original totals and reconcile each stratum back to them before interpretation.

See how the method works

Visit the work to understand how the process actually functions and what makes it difficult for the people doing it. Agree the purpose, observe a real sequence and ask about the difference between expected and actual conditions. Avoid turning every answer into an immediate instruction. Clarify what support is needed, make a specific commitment and return to check what happened. The quality of the visit is shown by learning and follow-through, not distance walked or boxes checked. Respect privacy and safe observation boundaries. A worker who exposes a problem should receive help, not punishment for making it visible.



Connected method map: Agree purpose, Observe and ask, Agree support, Return and verify. Every authored connection is shown with a numbered arrow and named legend.

Observation, question and support record

At the work	Meaning / question	Next evidence
Screen then note	What decision needs the note?	Carrier cut-off at packing
Screen omits cut-off in this view	How is the official value supplied?	Process owner verifies route
Note currency unknown	Could a stale value misdirect work?	Compare authorized reference
Support agreed	Trial an approved information method	Return and observe correct availability

The note is wrong today

The reference check finds that the handwritten cut-off differs from the current approved value.

Decision

Use the local response for affected work and establish the approved reference immediately. Continue investigating why the work depended on the note.

Reasoning

Respectful learning does not ignore a real error; correcting the current risk does not erase the underlying information gap.

What would change the decision?

Record affected scope, current correction and the separate process-design follow-up.

See how the method works

Leaders need a repeatable way to support the work and develop problem solvers. Choose routines for observing conditions, responding to abnormalities, coaching reasoning and checking commitments. Make the timing and responsibility clear while leaving room to respond to real events. During coaching, ask the owner to explain the gap and evidence rather than taking over the solution. Review whether the routine removes obstacles and strengthens capability. A completed calendar is not the result. Different leadership levels have different work: a supervisor supports the immediate process, while a manager often removes barriers crossing several teams or functions.

Read every connection

1. Step 1 > 2
Need for support

2. Step 2 > 3
Learning opportunity

3. Step 3 > 4
Agreed next step

4. Step 4 > 5
Evidence

5. Step 5 > 1
Next cycle

Connected method map: Observe conditions, Respond to abnormalities, Coach reasoning, Verify commitments, Adapt the routine. Every authored connection is shown with a numbered arrow and named legend.

Commitment L17 - ownership and verification are explicit

Rhythm point	Owner / action	Evidence / decision
07:00 board	Imani asks for prediction	Done label lacks result; observe
07:10 at work	Leo responds to K42 gap	Missing readiness mark recorded
07:20 coaching	Leo proposes role-agreement trial	Prediction differs from installed sign
Before 10:00	Imani secures materials support	Named counterpart accepts test
10:15 review	Leo reports observed handoff	Result still pending; no automatic closure
Weekly reflection	Imani reviews her routine	Check follow-through and owner capability

The review is overdue again

At 10:15 Leo reports that the replenishment counterpart was reassigned and the trial did not occur. The board is still green because the sign remains installed.

Decision

Change the commitment to trial not completed, retain Leo's ownership and escalate the unprovided support to the materials manager. Agree a realistic next observation rather than declaring the idea ineffective.

Reasoning

No trial means no evidence about the proposed method. The missed support commitment is itself a leadership-system issue.

What would change the decision?

Record the failed prerequisite, receiving manager, new commitment and its verification point; do not fabricate a trial result.

See how the method works

A daily board should make an important gap visible and connect it to a response. Compare actual performance with a meaningful standard, identify the issue requiring action, and record an owner and review time. Escalate barriers that the team cannot remove, then bring the answer back. Verify whether the condition changed rather than closing an item because an email was sent. Preserve urgent response routes outside the meeting. Repeated gaps may need a deeper investigation. A board full of green indicators is not proof of stability if people have learned to hide exceptions or change the counting rules.

Read every connection

1. Step 1 > 2
Compare

2. Step 2 > 3
Priority gap

3. Step 3 > 4
Beyond team authority

4. Step 4 > 5
Return response

5. Step 3 > 5
Team resolution

6. Step 5 > 1
Learn / update

Connected method map: Plan / standard, Actual / gap, Response, Escalated support, Closure evidence. Every authored connection is shown with a numbered arrow and named legend.

Completed huddle response plan - outcomes pending

Gap	Owner / next action	Review / closure evidence
4 missing labels	Label coordinator + accepted support owner	09:20; correct labels on affected orders
2 clarifications	Customer liaison obtains missing details	09:30; complete confirmed order information
No escalation acknowledgment	Lead seeks next-level support	Named receiving commitment
Total 6 not ready	Lead reconciles order status	Ready only after defined checks

Support says fixed but one order still fails

A fictional 09:20 review finds three label-blocked orders ready but one label remains incorrect. The two clarification cases are still open.

Decision

Update actual ready to 21 and retain three unresolved orders: one label plus two clarifications. Reopen or continue the specific label response.

Reasoning

A broad fixed message must not turn all four orders green.

What would change the decision?

18 + 3 = 21; 24 minus 21 = 3. Order identities and the failed label evidence remain visible.

See how the method works

Start with a small number of strategic gaps that matter to the organization. Discuss proposed contributions with the teams expected to deliver them, including resources, conflicts and feasibility. Alignment needs dialogue across functions as well as between levels. Link agreed work to observable measures and learning, then review progress and adjust the means when evidence changes. Frontline experience should inform strategic choices, not merely receive targets. A matrix can summarize the relationships but cannot replace those conversations. Use daily management to understand current capability and A3 thinking to carry the reasoning behind important improvement work.

Connected method map: Strategic gap, Proposed contribution, Catchball, Agreed improvement, Review evidence. Every authored connection is shown with a numbered arrow and named legend.

Completed catchball agreement - trial results pending

Alignment item	Agreed contribution	Evidence / review
Purpose	Sooner reliable repair-date confirmation	Delay and later promise accuracy
Trial scope	Defined priority subset reviewed daily	Case identities and eligibility
Capacity tradeoff	Director approves deferred work	Specialist time and displaced demand
Shared ownership	Planning + purchasing counterparts	Accepted handoff and blockers
Learning return	Review before wider rollout	Revise means if reliability/workload worsens

Speed improves but promises become unreliable

A hypothetical trial shortens initial confirmation, but several dates are revised because availability was assumed rather than verified.

Decision

Do not scale the method as a success. Examine the missing verification and adapt the trial while preserving the customer reliability requirement.

Reasoning

Optimizing one measure can defeat the strategic purpose.

What would change the decision?

Report both confirmation time and revised promises, with affected conditions and the next test.

See how the method works

When the direction is clear but the route is uncertain, practice learning in small steps. Understand the challenge, observe the current process and describe a near-term target condition. Select one obstacle and state what you predict will happen in the next safe test. Compare the actual result with the prediction and choose the next step from what was learned. The coach helps the learner think clearly rather than prescribing a hidden preferred answer. A target condition describes how the process should operate; it is not merely a list of actions. Keep the learning cycle connected to customer and process needs.

Connected method map: Challenge, Current condition, Target condition, Next experiment, Learn. Every authored connection is shown with a numbered arrow and named legend.

Completed experiment learning strip

Cycle	Prediction / actual	Learning / next step
Current	4 of 6 receivers named	Two handoffs lack identity
Trial 1: receiver field	Predict 6 of 6; actual 4 of 6	Field alone does not resolve role
Observe blanks	Both have unclear receiving responsibility	Test role agreement
Trial 2 planned	Agree counterpart before handoff	Result not yet observed

A test improves the count by hiding cases

A proposed second trial excludes all requests with unclear receiving roles and achieves six named receivers among six included requests.

Decision

Report the exclusion and its limitation. Do not claim the original obstacle resolved; design a safe test that actually addresses the unclear-role cases.

Reasoning

Changing the population can make the count improve without changing the process that caused the gap.

What would change the decision?

Retain inclusion rules and excluded-case reasons beside the result.

See how the method works

Prepare the learner, the task and the materials before instruction begins. Present the important steps, key points and reasons at a pace the learner can absorb. Then ask the learner to perform the work and explain those points while the instructor observes. Correct gaps and follow up until competence is demonstrated under the expected conditions. Attendance or watching once is not enough. Use an approved job breakdown, and distinguish training notes from the production chart used to balance a process. Good instruction also reveals unclear standards that need improvement rather than repeated reminders to the learner.

Read every connection

1. Step 1 > 2
Ready

2. Step 2 > 3
Practice

3. Step 3 > 4
Observe competence

4. Step 4 > 2
Revisit gaps if needed

Connected method map: Prepare learner, Present job, Try and explain, Follow up. Every authored connection is shown with a numbered arrow and named legend.

Original job breakdown - register a training request

Important step	Key point	Reason
Select request	Match full source and screen ID: CR218	Avoid changing CR281
Record receipt	Use supplied 09:12, not current time	Preserve actual receipt chronology
Assign queue	Use approved routing reference	Send work to responsible team
Verify saved record	Reopen and check ID/time/queue	Detect entry or save mismatch

Correct actions, unexplained key point

Luis completes a second example but says the identity check is only because Sana prefers it. He cannot explain the look-alike risk.

Decision

Revisit that key point and reason, then observe another attempt where the distinction matters. Keep supported-practice status rather than declaring full task competence.

Reasoning

A memorized sequence without understanding may fail when a small condition changes.

What would change the decision?

Observe the learner deliberately comparing identities and explaining the consequence of a mismatch.

See how the method works

A clean condition is useful because it makes abnormalities easier to see and work easier to perform. Define the expected condition and the approved cleaning or inspection method. Record what is found, respond to recurring problems and verify the condition later, including another shift when relevant. An after photograph captures one moment; sustain needs evidence over time. A glossy surface or completed checklist cannot show that a leak was resolved. Use dated observations and response records to tell that story. Keep cleanup materials and disposal within local controls, and do not depict a tidy area as a completed safety assessment.

Read every connection

1. Step 1 > 2
Check actual

2. Step 2 > 3
Abnormality

3. Step 3 > 4
Verify effect over time

4. Step 4 > 1
Update standard from learning

Connected method map: Expected condition, Clean and inspect, Respond to finding, Later check. Every authored connection is shown with a numbered arrow and named legend.

Dated condition history - illustrative records

Point in history	Evidence	Status / next decision
Monday	Clean-to-inspect reveals residue	S12 open; technical response
After response	Action recorded	Verification still required
Tuesday	Fresh trace at same point	Recurrence; retain unresolved status
Friday planned	Comparable later check	No result supplied; do not claim sustained

The later photograph uses different conditions

Friday's image shows a dry floor immediately after cleaning while the machine has not operated in the condition used for Tuesday's check.

Decision

Label the condition difference and obtain an appropriate comparable check. The image can document cleaning, but not absence of recurrence under the relevant condition.

Reasoning

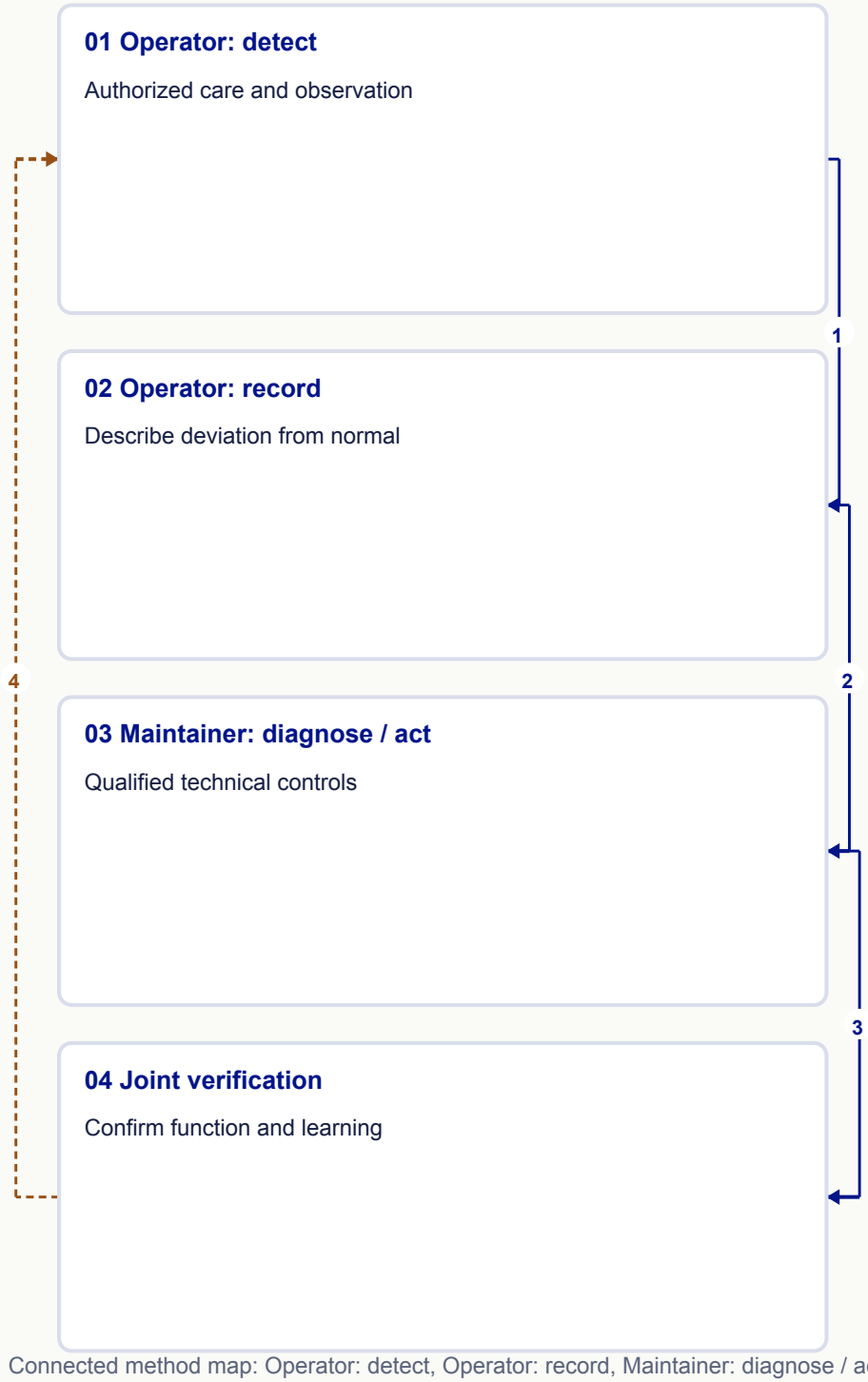
Changing observation conditions can create a misleading before/after claim.

What would change the decision?

Record timing, operating context and the exact condition being compared.

See how the method works

Operator care and specialist maintenance contribute different capabilities. Define which observations, cleaning and checks the operator is trained and authorized to perform, with a clear reference for normal condition. When a deviation appears, record it and use the agreed response route. Technical diagnosis, isolation and repair remain with qualified personnel under approved procedures. Verify the response with the operator so the finding does not disappear into a work-order queue. Repeated observations can improve the care standard and maintenance plan. The word autonomous does not mean unrestricted repair, and a generic equipment-health score cannot replace evidence of condition.



Read every connection

1. Step 1 > 2
Abnormal condition

2. Step 2 > 3
Escalate technical need

3. Step 3 > 4
Resolved / tested

4. Step 4 > 1
Feedback to care routine

Connected method map: Operator: detect, Operator: record, Maintainer: diagnose / act, Joint verification. Every authored connection is shown with a numbered arrow and named legend.

Completed observation and handover - technical outcome still open

Record field	Entry	Meaning / next owner
Identity / reference	P4 base edge; NC-P4; 07:05	Operator: observed deviation
Condition	Oil trace; wiped smear; dry absorbent	Source unknown, not diagnosed
Immediate response	Local procedure followed; leader notified	Leader controls response status
Technical handoff	AM-P4 accepted by maintenance	Qualified assessment pending
Verification	Same approved condition and point	Joint evidence before closure
Feedback	Recurrence returns to AM-P4	Owner updates approved care routine

Residue returns after cleaning

A fictional follow-up under the agreed condition finds a fresh trace at the same point. The checklist still shows cleaning complete.

Decision

Record recurrence against AM-P4, retain or reopen unresolved status and send the evidence to maintenance and the leader. Review the immediate response again under the local procedure.

Reasoning

The cleaning task may be complete while the equipment condition remains unresolved. Repeating the wipe and closing the ticket would discard contrary evidence.

What would change the decision?

A comparable observation with time, location and condition challenges the closure claim; it does not by itself identify the cause.

See how the method works

Use asset function, failure history and deterioration evidence to decide what maintenance is needed. Distinguish tasks justified by time or condition from reactive work and repeated breakdown fixes. Plan the people, parts and access window before the task, then execute under the approved technical controls. Operations and maintenance should agree how correct function and readiness will be verified before return. Review whether the plan prevents important failures or simply creates more activity. Consistent failure and restoration definitions are needed before interpreting reliability measures. Operator observations provide useful evidence but do not replace specialist diagnosis or engineering acceptance criteria.

Read every connection

1. Step 1 > 2
Evidence

2. Step 2 > 3
Ready

3. Step 3 > 4
Completed task

4. Step 4 > 5
Observed outcome

5. Step 5 > 1
Improve plan

Connected method map: Review failure evidence, Plan justified work, Execute authorized work, Verify return, Review effectiveness. Every authored connection is shown with a numbered arrow and named legend.

Completed maintenance-plan review - action outcome pending

Review question	Finding	Next evidence / owner
Same failure?	Similar descriptions; mechanism unconfirmed	Technician reconciles event conditions
Task appropriate?	Purpose needs connection to loss	Technical owner reviews suitability
Task executed?	Completion tick lacks detail	Retrieve condition/action/verification evidence
Plan change?	Doubling frequency not justified yet	Planner prepares evidence-led work
Effective?	No future result supplied	Asset owner verifies function and recurrence

The record was complete but the task targeted another condition

Further fictional review confirms that the scheduled task was executed correctly, but its documented purpose does not address the interruption mechanism now supported by technical evidence.

Decision

Retain the completed-task record and revise the maintenance strategy through the technical owner. Do not label the technician noncompliant or simply repeat the irrelevant task faster.

Reasoning

Execution quality and task suitability are different explanations with different responses.

What would change the decision?

Link the supported failure mechanism to the proposed task and define how effectiveness will be reviewed.

See how the method works

Declare the planned production time before calculating equipment effectiveness. In this exercise, 360 run minutes from 450 planned minutes gives 80% availability. Six hundred units at an ideal half-minute each represent 300 ideal minutes, giving 83.33% performance during run time. Of those units, 570 are good first time, giving 95% quality. Multiplying the three factors yields 63.33% OEE, equivalent to 285 good ideal minutes out of 450. Investigate the underlying loss rather than chasing the score. Reworked output is not first-pass good, and making unwanted inventory cannot establish better customer flow.

Time retained and loss, on one minute scale

Keep the denominators visible

A = 360 / 450 = 80%
P = (600 x 0.5) / 360 = 83.33%
Q = 570 / 600 = 95%
OEE = 285 / 450 = 63.33%

Method exhibit: Planned time, Run time, Ideal total time, Good ideal time.

Completed loss reconciliation - fictional shift

Stage / factor	Calculation	Result / loss
Availability	360 / 450	80%; 90 min loss
Performance	600 x 0.5 / 360	83.33%; 60 min equivalent
Quality	570 / 600	95%; 15 min ideal equivalent
OEE	285 / 450	63.33%
Reconcile	90 + 60 + 15 + 285	450 min total

Twenty rejected units are recovered later

The 30 non-first-pass units include 20 subsequently reworked and accepted. A colleague proposes changing first-pass good from 570 to 590.

Decision

Keep first-pass quality at 570 / 600 = 95% for this defined original pass and record rework/recovery separately. Clarify how any rework resource/time enters the relevant reporting scope.

Reasoning

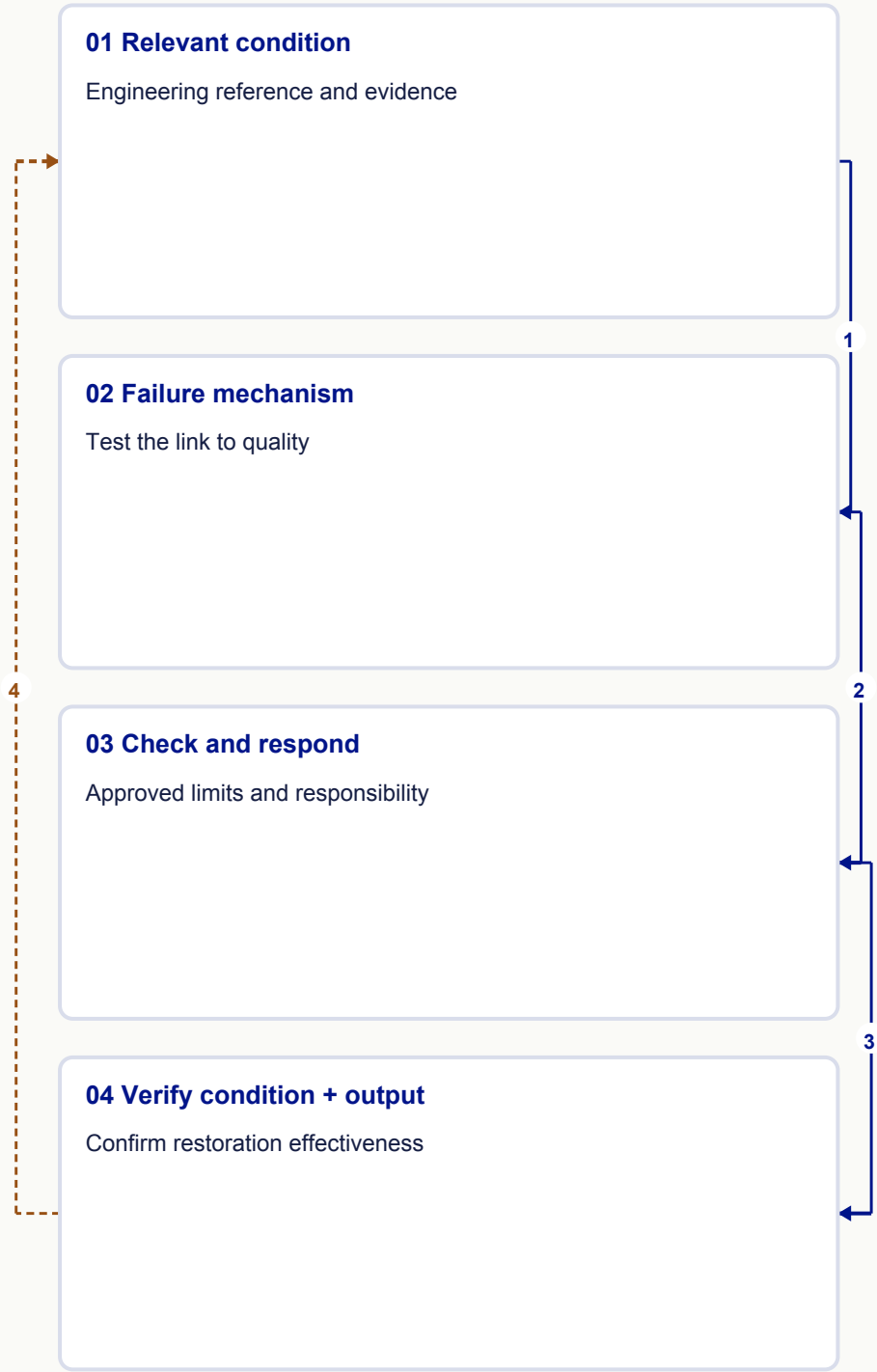
Recovery changes disposition, not first-pass history. Mixing scopes can count output or time twice.

What would change the decision?

Retain the original counts, rework identities, subsequent disposition and approved time-accounting rule.

See how the method works

Finished-product inspection may find a defect after the process has already lost its required condition. Identify the mechanism that connects a relevant equipment or process condition to the quality characteristic. Define an approved way to check that condition, the response to drift and how restoration will be verified. Keep the evidence linking condition and outcome explicit; correlation alone is insufficient. Maintenance, quality and operations each contribute to the loop. Avoid inventing universal limits for pressure, temperature, wear or alignment. The teaching diagram explains the relationship and responsibilities, while technical criteria remain with the appropriate engineering authority.



Read every connection

1. Step 1 > 2
Hypothesized relationship

2. Step 2 > 3
Evidence-based control

3. Step 3 > 4
Response result

4. Step 4 > 1
Maintain and learn

Connected method map: Relevant condition, Failure mechanism, Check and respond, Verify condition + output. Every authored connection is shown with a numbered arrow and named legend.

04 / Verify condition and output together

After technical acceptance of the restored locating condition, quality checks the relevant output under the approved plan. If defects remain, the team retains the unresolved quality issue and investigates alternatives.

Why: A restored machine condition does not by itself prove that product risk or the proposed mechanism has been resolved.

Evidence / check: Separate condition and product verification feed the maintenance/control routine only after reviewed learning.

Completed condition-to-quality investigation plan

Link / check	Planned evidence	Decision boundary
Residue > seating	Observe locating condition and seating	Hypothesis, not proven cause
Seating > mark	Link component/job to measured mark position	Use approved measurement/reference
Authorized restoration	Record actual technical action and condition acceptance	No improvised adjustment
Output verification	Check relevant product under approved plan	Condition pass alone is insufficient
Sustain	Maintain supported condition/check with owner	Review recurrence and alternatives

The condition passes but the defect remains

A fictional follow-up verifies that the locating condition meets its approved reference, yet another comparable job still has the mark-location defect.

Decision

Keep the quality issue open and investigate the remaining mechanism links and alternatives. Preserve the valid condition-restoration record without claiming that it solved the defect.

Reasoning

Contrary output evidence challenges the proposed sufficient cause or the completeness of the response.

What would change the decision?

Link the passing condition check, job identity and failing product measurement; reassess component and marking references.

See how the method works

Define the system goal and identify what currently limits it. First examine how to use the existing constraint effectively, then align other work to support that decision. Add capacity or make a larger change when the evidence shows it is needed. After improvement, look again: the limiting factor may move, and old rules can become the next obstacle. The loop is about system performance, not making every resource equally busy. Exploiting a constraint means protecting useful capability, not overburdening people or bypassing maintenance and quality. Verify the result through the defined system outcome and repeat the learning cycle.

Read every connection

1. Step 1 > 2
Verified focus

2. Step 2 > 3
Chosen use

3. Step 3 > 4
Further capability needed

4. Step 4 > 5
Constraint may change

5. Step 5 > 1
Avoid inertia

6. Step 3 > 5
Constraint already broken: reidentify

Connected method map: Identify, Exploit, Subordinate, Elevate, Repeat. Every authored connection is shown with a numbered arrow and named legend.

05 / Repeat when the limiting condition changes

After finishing demonstrates 95, compare again: cutting 110, finishing 95, test 85, demand 90. Final test is now the first internal constraint hypothesis; revise support rules and investigate its losses.

Why: Continuing to optimize finishing through habit would not remove the current modeled 85-unit delivery limit.

Evidence / check: Return to identification; modeled system gap is now 5 units against demand, not the old 20.

Completed focusing-step decision trail

Decision	Evidence	Result
Identify	110 / 70 / 85; demand 90	Finishing hypothesis
Exploit	Missing kits/rework to investigate	Use existing resources better
Subordinate	Release and support plan	Align local rules
Re-identify after trial	110 / 95 / 85	Final test hypothesis
Further finishing investment	Old constraint no longer lowest	Reassess before committing

Demand drops below all capacities

Confirmed demand falls to 60 while all stages retain the original 110, 70 and 85 capacities.

Decision

Reconsider the system boundary and market/demand limitation rather than declaring finishing a binding internal constraint against this demand.

Reasoning

The slowest resource can have spare capacity relative to current demand.

What would change the decision?

Demand basis and constraint hypothesis are revised together.

See how the method works

A visible queue is a clue, not a diagnosis. Compare required load with effective capacity over a representative mix and horizon, and observe when processes are starved, blocked or interrupted. In the simple exercise, demand is ten units per hour while stage capacities are twelve, eight and eleven; stage B is the first limiting hypothesis. Real systems need evidence about variability, routing and policies before that conclusion is accepted. The constraint can also be outside the equipment chain, such as demand or an approval rule. Test the hypothesis and recheck it after a material change.

Dashed mark: demand 10 units/hour

Stage	Capacity / hour	Demand / hour
A	12	10
B	8	10
C	11	10

Hypothesis: B. Single route, Comparable effective capacities, Stable stated mix, Demand available. Observe interruptions, starvation, blocking and policy effects.

Method exhibit: Stage A, Stage B, Stage C, Demand.

04 / Observe the candidate's actual conditions

Record whether B has ready eligible work, required resources and downstream space. Separate its processing losses from time starved by upstream information or blocked by downstream problems.

Why: The limiting condition may be a policy, supply or quality issue rather than B's equipment itself. Improvement must address the actual mechanism.

Evidence / check: Observation log distinguishes working, starved, blocked and abnormal states with causes to investigate.

05 / Revise the hypothesis when evidence changes

Compare sustained accepted output and demand after a controlled change. If another condition now limits the system, update the focus and supporting rules.

Why: A constraint label is not permanent property of a machine. Persisting with an obsolete label is a decision error.

Evidence / check: System output, demand basis and current evidence support the next decision.

Completed evidence-based hypothesis

Question	Evidence	Conclusion
Lowest comparable rate	B = 8/hour	Initial internal hypothesis
Demand relation	10 required versus 8 modeled	Gap 2/hour
Largest queue	Before C; history unknown	Investigate, do not infer
Observed mechanism	Not yet supplied	Collect state and cause record
Improvement claim	No trial outcome supplied	Keep provisional

B is repeatedly starved

Observation shows B often has no ready material because an upstream release rule batches work late, despite A's average capacity exceeding B's.

Decision

Investigate and test the release/readiness mechanism before assuming more B equipment will solve the loss.

Reasoning

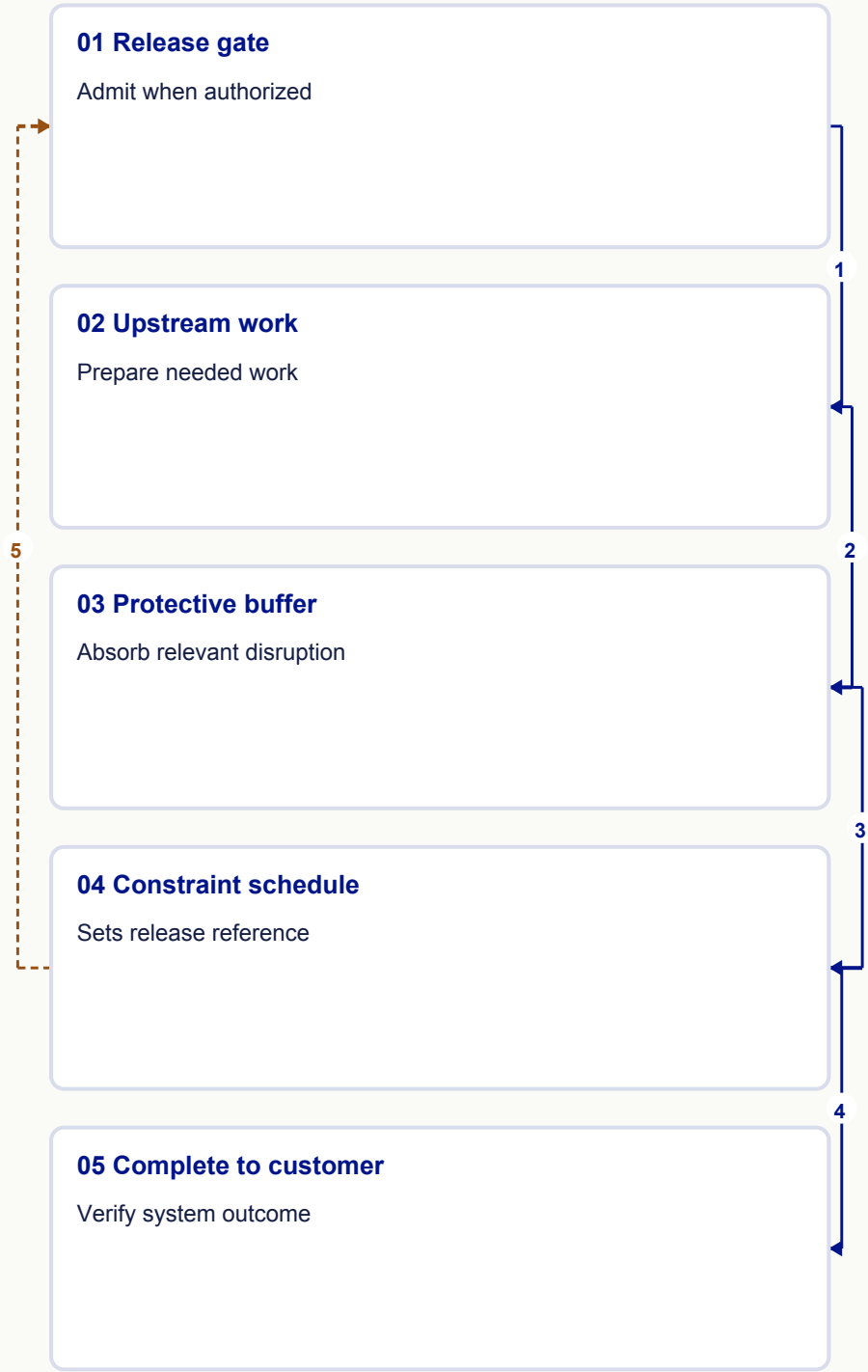
Average capability and timely availability are different. The actual limiting condition may be how work reaches B.

What would change the decision?

Time-stamped starvation and release evidence guide the revised hypothesis.

See how the method works

Releasing work early can create congestion without bringing completion forward. Drum-buffer-rope links release to the schedule of a verified constraint. The drum sets the relevant pace, the buffer protects it from disruption, and the rope communicates when upstream work should enter. Draw the control signal separately from the movement of work. Choose protection from the process conditions rather than copying an arbitrary quantity. Monitor starvation, missed commitments and excess work while trialing the rule. This is a constraint-based release mechanism; it should not be presented as identical to a supermarket replenishment loop or a customer takt calculation.



Read every connection

1. Step 1 > 2
Work

2. Step 2 > 3
Ready work

3. Step 3 > 4
Protected feed

4. Step 4 > 5
Completed constraint work

5. Step 4 > 1
Rope: release timing

Connected method map: Release gate, Upstream work, Protective buffer, Constraint schedule, Complete to customer. Every authored connection is shown with a numbered arrow and named legend.

Completed planned release record - not observed performance

Job	Drum start	Release / nominal ready	Decision
J41	10:00	08:30 /09:00	90 min lead; 60 min allowance
J42	10:30	09:00 /09:30	90 min lead; 60 min allowance
J43	11:00	09:30 /10:00	90 min lead; 60 min allowance
08:00 bulk proposal	All jobs early	Not schedule-linked	Decline; protect required work

J42 may miss the drum

At 09:50 the upstream owner estimates J42 will be verified ready at 10:40, ten minutes after its 10:30 drum appointment. J43 is not a technically interchangeable substitute.

Decision

Escalate J42's specific blocking condition and review the drum schedule through its owner. Do not feed unverified work, silently swap incompatible jobs or release every later order.

Reasoning

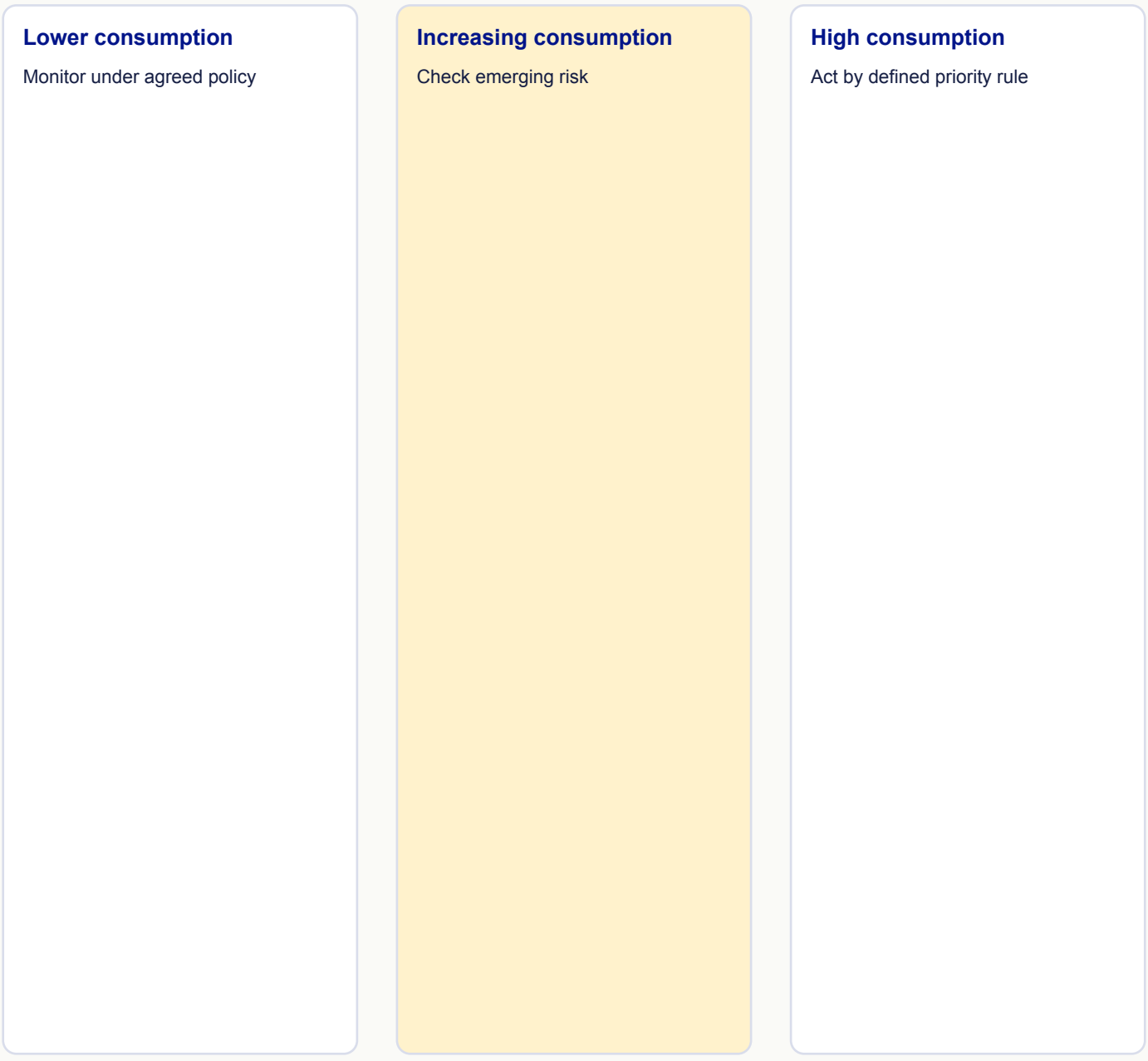
The protective allowance is exhausted for this prediction. More unrelated WIP does not recover the threatened appointment.

What would change the decision?

The record names the ten-minute predicted miss, blocker, recovery estimate and authorized schedule decision; a recovery outcome is not invented.

See how the method works

A buffer only helps management when its consumption is visible and tied to a response. Define the buffer type, units and operating policy before using colored zones. Track which work is consuming protection, apply the agreed priority rule and record what caused the disruption. Repeated risk should trigger investigation and review of the system, not a permanent emergency mode. The diagram's zones are illustrative rather than prescribed thresholds. Production, project and replenishment buffers have different meanings, so their measures must not be mixed. Use the history to improve reliability and decide whether the protection or release policy needs revision.



Agree local priority and escalation rules. No universal percentage thresholds.

Method exhibit: Measure protection, Prioritize response, Record disruption, Improve reliability.

04 / Separate recovery from learning

Record the cause and recovery for J1, then examine the five-episode log. Three drawing-approval episodes justify investigating that dependency, not declaring its root cause proven.

Why: Firefighting the current job and improving the recurring system condition are different tasks. A count prioritizes inquiry, not causal certainty.

Evidence / check: Approval dependency selected for investigation, with examples and timestamps retained.

05 / Review protection through its owner

After representative evidence, the owner reviews reliability, release assumptions and buffer adequacy. Do not enlarge protection solely to remove a color from the screen.

Why: A parameter change can conceal delays while increasing lead time or inventory. It needs a system-outcome prediction and follow-up.

Evidence / check: Policy/parameter review names evidence, decision and subsequent delivery check.

Completed priority and learning record

Item	Immediate decision	Follow-up
J1 high, blocked	Escalate approval; no invalid start	Record missing decision and response
J2 increasing, ready	Next eligible work	Monitor commitment protection
J3 lower, ready	Remain queued	Review when status changes
3 of 5 approval episodes	Investigate recurring dependency	Do not infer root cause yet
Buffer enlargement	Not automatic	Owner reviews reliability and assumptions

J1 becomes ready while J2 is underway

The approval arrives after J2 has started.

Decision

Reassess priority using the agreed interruption policy, setup costs and current process state; do not assume a mid-task stop is harmless.

Reasoning

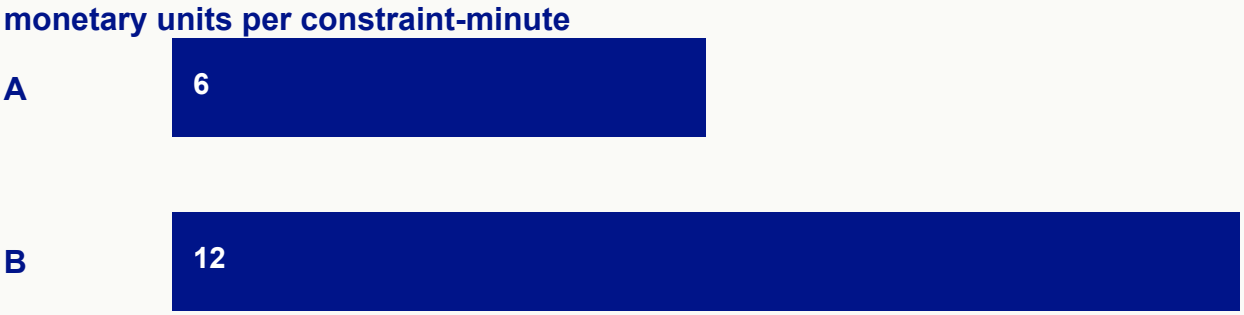
Protection status informs coordination but does not replace safe execution or the declared dispatch rules.

What would change the decision?

The next dispatch decision records readiness change and the applicable interruption rule.

See how the method works

For a bounded decision, compare the effect on the system rather than local output alone. Financial throughput depends on sales and truly variable costs over a period; producing unsold stock does not create that throughput. In the single-constraint illustration, products A and B each provide 60 monetary units per sale, but use ten and five constraint-minutes respectively. Their rates are therefore six and twelve per constraint-minute. This helps frame a choice, but demand limits, other capacity, operating expenses and commitments still matter. Have finance validate definitions. Mission-led services should state their goal units instead of inventing a monetary proxy.



Product	Price	Truly variable cost	Constraint min	Rate
A	100	40	10	6
B	90	30	5	12

Introductory comparison with one verified binding constraint; not a complete product-mix solution. Each product contributes 60 monetary units per sale.

Method exhibit: Product A, Product B, System decision.

05 / Check the system outcome

Review actual accepted sales, constraint use and relevant expense/investment consequences with the responsible owners. Do not claim profit from a local utilization increase.

Why: The rate is an introductory decision aid. Unchanged overhead, incremental expenses and real commitments still matter to the full decision.

Evidence / check: A documented feasible alternative and whole-system outcome replace an unsupported profit claim.

Completed introductory rate comparison

Product	Contribution per sale	Constraint time	Rate
A	100 − 40 = 60	10 min	6 monetary units/min
B	90 − 30 = 60	5 min	12 monetary units/min
Interpretation	Equal per-unit contribution	Different scarce-time use	Check demand and commitments

There is no additional demand for B

All currently sellable B demand is already covered. A still has confirmed demand.

Decision

Do not make more B merely because its calculated rate is higher. Evaluate eligible A demand and the real remaining constraints.

Reasoning

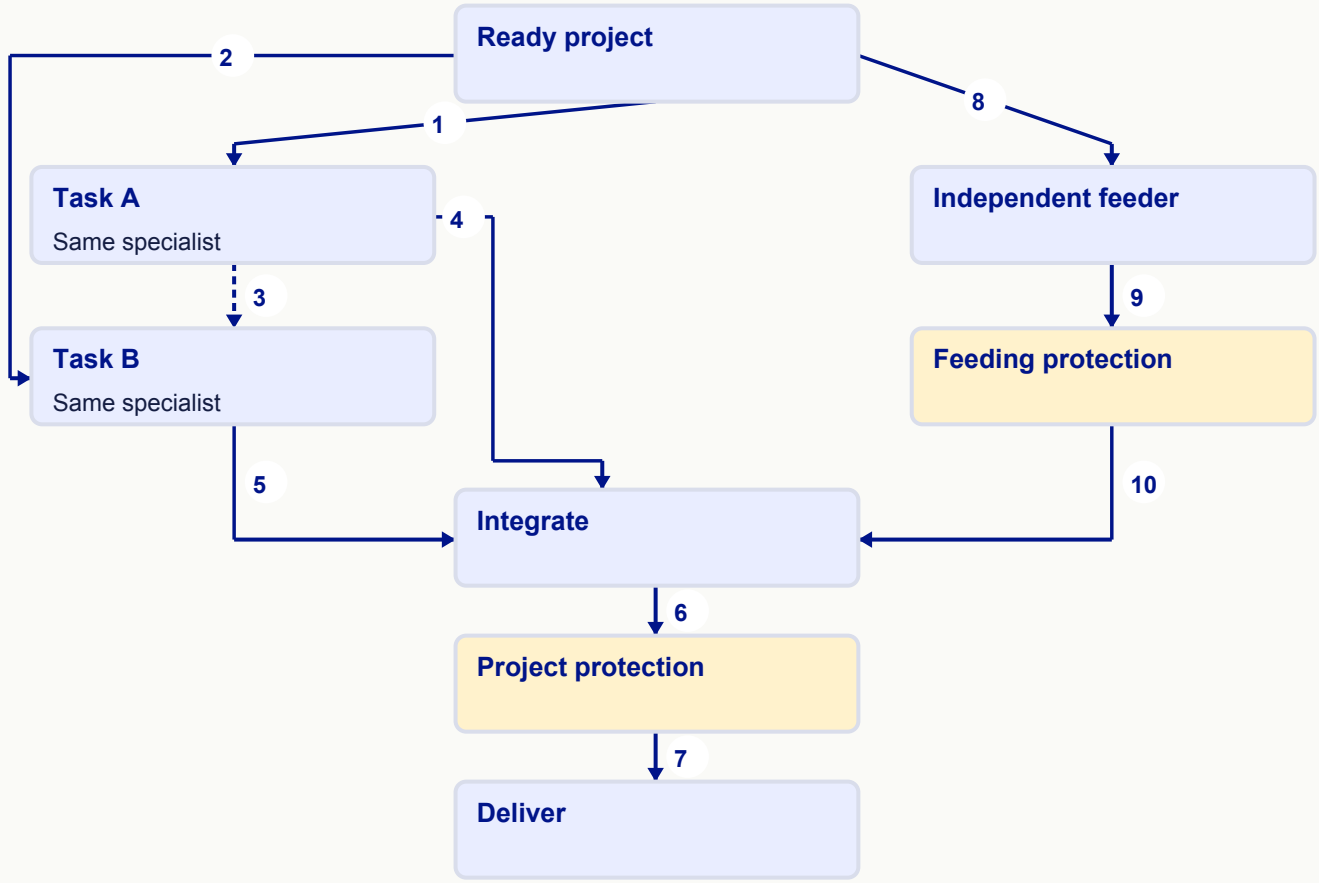
The rate does not turn unwanted inventory into sold throughput.

What would change the decision?

The decision records the B demand cap and the remaining feasible sales opportunity.

See how the method works

Project delay can come from resource contention even when a task-dependency diagram looks reasonable. Identify the shared resources as well as the order in which work must occur, then build a feasible plan. Make uncertainty protection visible at the project and feeding connections rather than hiding it independently in every task. Limit harmful switching among too many active jobs and review buffer consumption to focus support. Do not mechanically halve all estimates or label an ordinary critical path a critical chain. The small network introduces the mechanism; actual project commitments require credible estimates, resource calendars and the relevant planning expertise.



1. Ready project > Task A
Task dependency

2. Ready project > Task B
Task dependency

3. Task A > Task B
Resource ordering needed

4. Task A > Integrate
Required output

5. Task B > Integrate
Required output

6. Integrate > Project protection
Protect commitment

7. Project protection > Deliver
Delivery target

8. Ready project > Independent feeder
Feeder dependency

9. Independent feeder > Feeding protection
Protect connection

10. Feeding protection > Integrate
Required feeder output

One shared specialist; independent feeder resource. No task durations or buffer-sizing formula supplied.

The project network distinguishes task dependencies, a shared-resource ordering link, an independent feeder and protection points. Durations are not supplied.

04 / Obtain the data required for a real schedule

Gather task-duration estimates with their basis, calendars, resource commitments, readiness constraints and risk assumptions. Then analyze a resource-feasible network and justified protection policy.

Why: Without durations and resource conditions, the drawing teaches interaction but cannot identify the actual limiting chain or promise a completion date.

Evidence / check: Required scheduling inputs and responsible owners are listed.

05 / Manage execution and learn from protection use

During the eventual approved plan, keep readiness, remaining work and agreed priorities visible. Review repeated interruptions or feeder failures with their owners.

Why: Starting many tasks to show activity can increase harmful switching while delaying the accepted project outcome.

Evidence / check: Execution review addresses the project's commitments rather than each task's appearance of busyness.

Completed network audit - no invented durations

Link / field	Classification	Audit conclusion
Ready > A and B	Task prerequisites	Both logically ready
A > B in proposal	Resource ordering	Shared specialist cannot overlap
F > Integration	Independent feeder dependency	Must remain visible
Feeding / project protection	Distinct provisions	Sizing evidence required
Completion date / chain length	Not calculable here	Durations and calendars absent

The feeder now needs the same specialist

A scope change makes F depend on the same specialist as A and B.

Decision

Rebuild the resource-feasible sequence and reassess the network/protection assumptions; do not leave F running independently on the old chart.

Reasoning

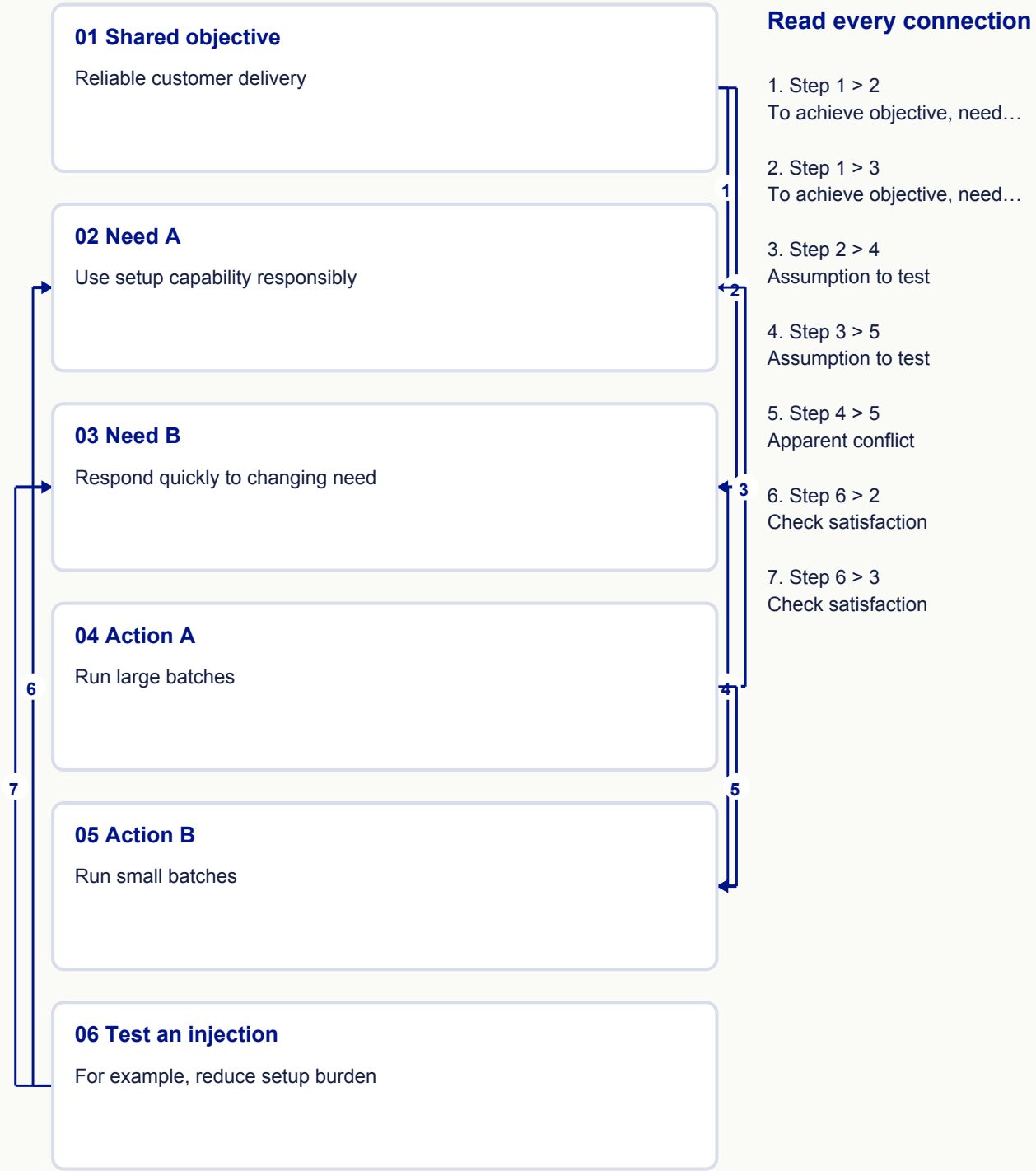
Changing a resource requirement can change the limiting schedule even when the logical output dependencies remain unchanged.

What would change the decision?

Revised resource assignment and sequence are explicit; timing remains uncalculated until data exist.

See how the method works

Begin by stating an objective both sides can support. Describe each legitimate need and the action each side believes is required to satisfy it. Put the conflicting actions beside each other, then examine the assumptions connecting the boxes. Look for a change that can satisfy both needs without preserving the conflict. That proposed injection remains a hypothesis: test its practical consequences and look for unwanted effects. Do not disguise a preferred solution as neutral logic or assume compromise is the only option. The drawing supports a respectful discussion of policies and beliefs, not a verdict about which person is wrong.



Connected method map: Shared objective, Need A, Need B, Action A, Action B, Test an injection. Every authored connection is shown with a numbered arrow and named legend.

Completed conflict and assumption record

Element	Statement	Next test
Objective	Reliable delivery	Both owners agree
Need A / action A	Responsible setups / large batches	Is all preparation necessarily internal?
Need B / action B	Responsiveness / small batches	Which release pattern serves actual changes?
Injection	Approved external kit preparation	Measure both needs
Unwanted effects	Readiness/quality/workload	Include in trial review

A minimum processing batch is technically required

Evidence shows an approved process requires a specific processing batch, and no alternative is yet qualified.

Decision

Retain that requirement and explore other assumptions, such as transfer batching or preparation delay, with the responsible owner.

Reasoning

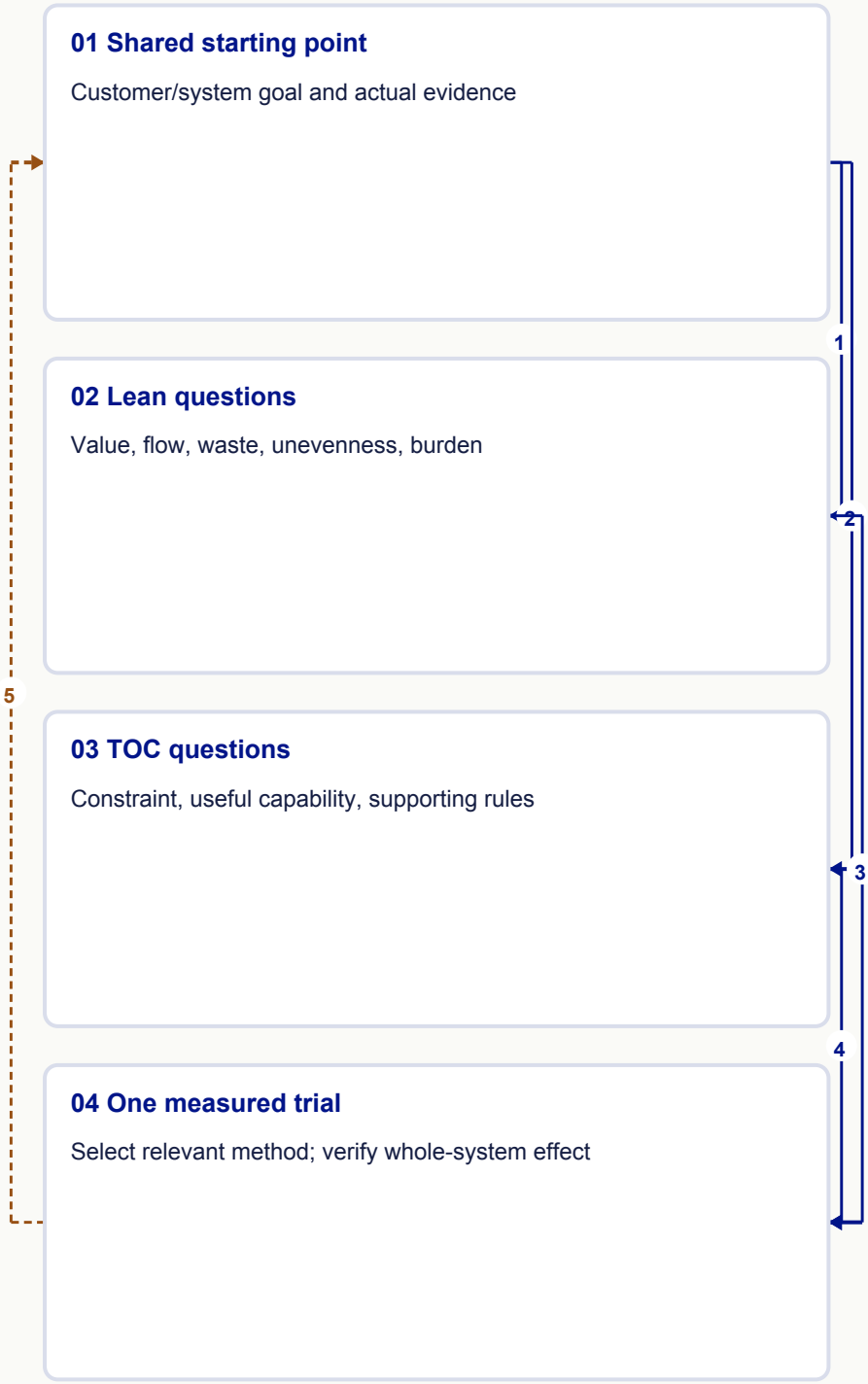
Challenging an assumption does not grant authority to ignore a verified process constraint.

What would change the decision?

The revised cloud distinguishes a validated condition from an untested belief.

See how the method works

Start with the outcome and the actual problem, not a contest between methods. Lean questions can reveal customer value, waiting, unevenness, overburden and barriers to flow. Constraints thinking focuses attention on what limits the defined system goal and how other work should support it. A setup or reliability improvement may serve both perspectives when it addresses a relevant limitation. Keep the control mechanisms distinct: customer takt, a scheduled pacemaker, kanban authorization and a constraint-based release rule are not interchangeable labels. Choose a bounded intervention, verify the whole-system effect and update the method as the evidence changes.



Read every connection

1. Step 1 > 2
Examine

2. Step 1 > 3
Examine

3. Step 2 > 4
Relevant intervention

4. Step 3 > 4
Relevant intervention

5. Step 4 > 1
Learn and re-evaluate

Connected method map: Shared starting point, Lean questions, TOC questions, One measured trial. Every authored connection is shown with a numbered arrow and named legend.

Completed intervention choice

Question	Case evidence	Decision
System gap	Demand 10; test 8	Investigate test limitation
Lean inquiry	Incomplete kits, search/wait	Observe with operators
TOC inquiry	Kit readiness affects test	Align supporting work
Preparation speed	14 already above test 8	No demonstrated delivery benefit alone
Trial	Ready kits under one release rule	Measure delivery, WIP, quality and workload

A hazard is found at preparation

The observation reveals an uncontrolled safety condition at the nonconstraint preparation station.

Decision

Use the required safety response immediately through its owner; do not defer it because test is the current throughput hypothesis.

Reasoning

System improvement includes necessary conditions. Constraint focus does not authorize unsafe work elsewhere.

What would change the decision?

Safety action and the separate flow-improvement hypothesis are both visible.

See how the method works

Choosing a tool starts with the decision, not with a favourite diagram. A check sheet collects observations consistently; a Pareto ranks a stated burden; a histogram displays a distribution; and a scatter plot explores paired variables. A control chart adds time and a baseline model. A fishbone organizes possible causes, while stratification separates sources that pooling may hide. These tools can be used together, but each answers a different question. First write the question in plain language. Then choose the smallest useful display and state what further evidence is needed before acting.

Record consistently

Check sheet: define categories and denominator.

Rank a burden

Pareto: choose count, cost or time.

See a distribution

Histogram: retain time and source records separately.

Explore paired variables

Scatter plot: association does not prove cause.

Organize possible causes

Fishbone: branches remain hypotheses until tested.

Separate mixed sources

Stratification: compare relevant groups with denominators.

Monitor over time

Control chart: choose data model, baseline and response.

Choose from the question, then state the limit of inference. This is not an imposed problem-solving sequence.

Completed question-to-tool record

Question	Chosen view	Boundary
Where are most comparable complaints?	Pareto of complaint occurrences	Priority by frequency, not proven cause
Does time vary with batch size?	Scatter of paired jobs	Association only
Which explanations should be tested?	Fishbone plus test record	Branches remain hypotheses
Are sources hiding different patterns?	Stratified views	Keep denominators and uncertainty
How does behavior evolve?	Ordered monitoring view	Check baseline/model before control conclusions

The manager changes the basis

The manager now asks which complaint type consumes the most recovery hours.

Decision

Rebuild the Pareto using documented recovery time for every included category, label hours and retain the original frequency chart separately.

Reasoning

Changing the basis can change the rank. Adding hours to occurrence counts would produce an uninterpretable total.

What would change the decision?

A revised request names recovery hours and the same declared reporting window.

See how the method works

A useful check sheet makes the unit of observation visible. One rejected product can contain several distinct nonconformities, so a tally of faults is not automatically a count of failed products. Define each category, the inspection opportunity and the observation window before recording. Pilot the sheet with more than one observer and resolve ambiguous classifications. Keep identifiers or source labels that enable a later investigation without collecting unnecessary personal data. Record the denominator alongside the tally. Only then calculate a rate or compare shifts; a larger count may simply reflect a larger amount inspected.

Unit record / multiple faults allowed

U01	Scratch + Burr
U02	Scratch + Missing label
U03	Burr
U04	Scratch
U05	Missing label
U06	Other

Category tally

Scratch: ||| (3)

Burr: || (2)

Missing label: || (2)

Other: | (1)

6 / 50 units = 12% nonconforming
8 / 50 = 0.16 faults per unit

U01-U06 are six distinct nonconforming units; the remaining 44 inspected units have no recorded nonconformities.

A unit-by-category check sheet records six distinct affected covers and eight fault marks among 50 inspected covers. Category tallies reconcile to 3 scratches, 2 burrs, 2 missing labels and 1 other fault. The two labelled measures are 12% nonconforming units and 0.16 faults per inspected cover.

05 / Publish two labelled measures

The report states 6/50 = 12% nonconforming units and 8/50 = 0.16 nonconformities per inspected unit. Both retain the window and inspection scope.

Why: These rates answer different questions. Neither says that 16% of units failed, and neither establishes a process trend from this one window.

Evidence / check: A reviewer can trace each numerator and denominator to the same source sheet.

Completed inspection summary

Measure	Calculation	Interpretation
Nonconforming units	6 ÷ 50 = 12%	Fraction of inspected covers with at least one fault
Nonconformities per unit	8 ÷ 50 = 0.16	All recorded faults divided by inspected covers
Category reconciliation	3 + 2 + 2 + 1 = 8	Matches the eight unit-level category marks

A scratch is entered twice

A second transcription of U01's same scratch appears in the summary.

Decision

Reconcile against U01's original observation, correct the duplicate with a traceable amendment, and preserve the legitimate burr entry.

Reasoning

Correcting a duplicate is not deleting an inconvenient result. The source record and amendment explain why the total changes.

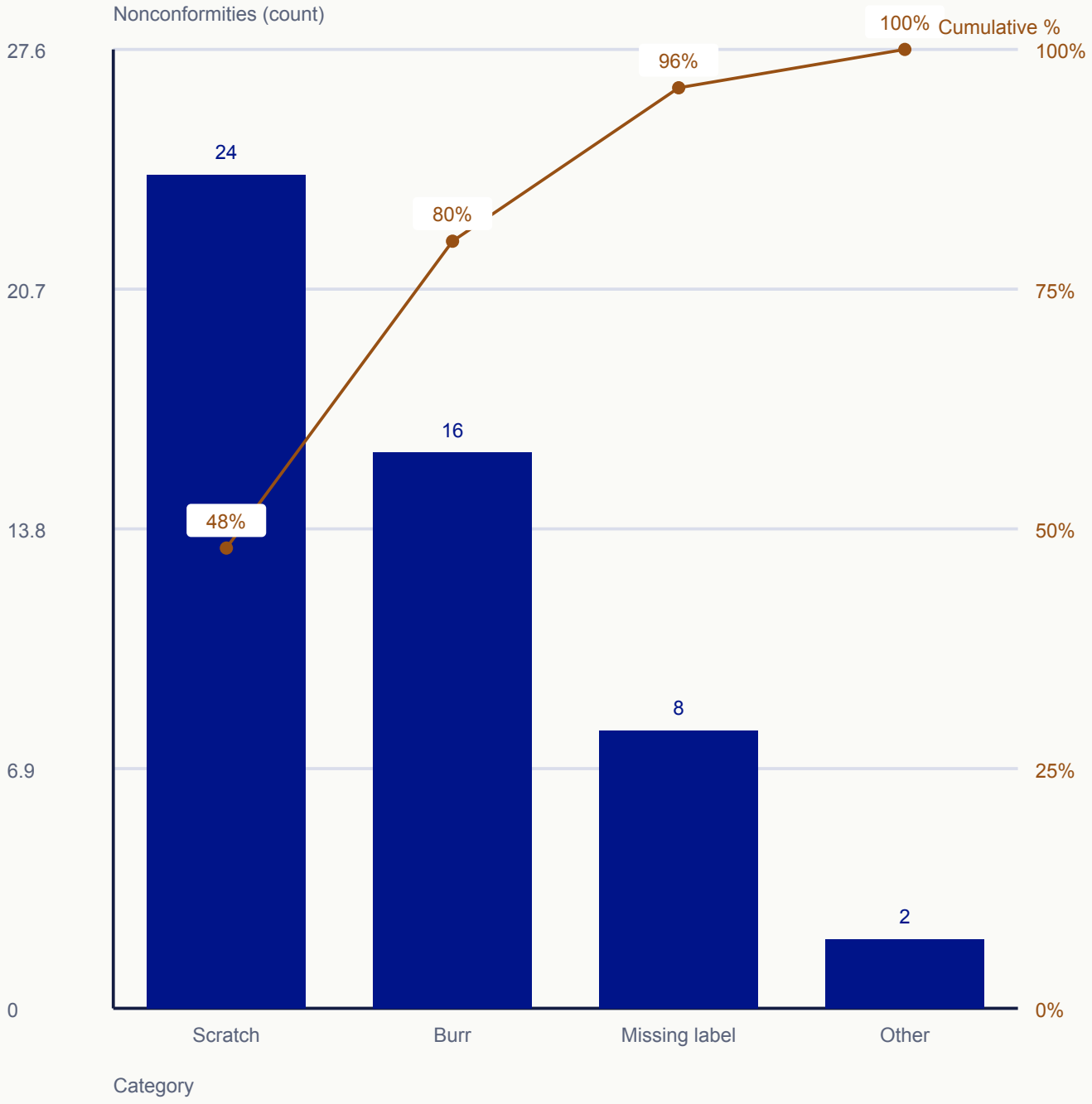
What would change the decision?

Corrected category count refers to one scratch observation on U01, not two.

See how the method works

A Pareto display ranks categories using one declared basis. Sort the bars from largest to smallest, then calculate cumulative share against the same total. Decide whether the current question concerns frequency, money, time or another burden before drawing the chart. Mixing costs for one category with counts for another produces an invalid ranking. The cumulative line helps show concentration, but it does not promise an eighty-twenty pattern or justify ignoring rare severe events. Use the ranking to select an investigation, then return to the underlying observations and risk context before deciding what to change.

Counts and cumulative contribution



Pareto chart of 50 fictional nonconformities: scratches 24, burrs 16, missing labels 8, other 2. Descending bars use counts; the separate cumulative-percentage axis reaches 48%,80%,96%,100%. The first two categories account for 80% of this example, without establishing a shared cause.

05 / Choose investigation without inventing cause

Rosa selects scratches for a frequency-focused observation study and flags any severe exceptions through the existing response process. She keeps the rival time-based priority visible for the resource decision.

Why: A category name does not explain why the fault occurs. The next work must locate conditions, test explanations and verify the consequence of an action.

Evidence / check: The decision record says priority for investigation, with cause still unverified.

Completed frequency-priority record

Rank by frequency	Count / cumulative share	Next interpretation
Scratch	24 / 48%	Largest occurrence category
Burr	16 / 80%	First two account for 40 of 50
Missing label	8 / 96%	Lower frequency; may consume more time per event
Other	2 / 100%	Review severity separately

A rare event is severe

One of the two "other" events involves a potentially significant product risk.

Decision

Use the applicable immediate escalation and containment process while retaining the descriptive frequency ranking. Do not wait for its bar to become large.

Reasoning

Frequency is one decision dimension. A Pareto chart does not authorize ignoring a severe low-frequency condition.

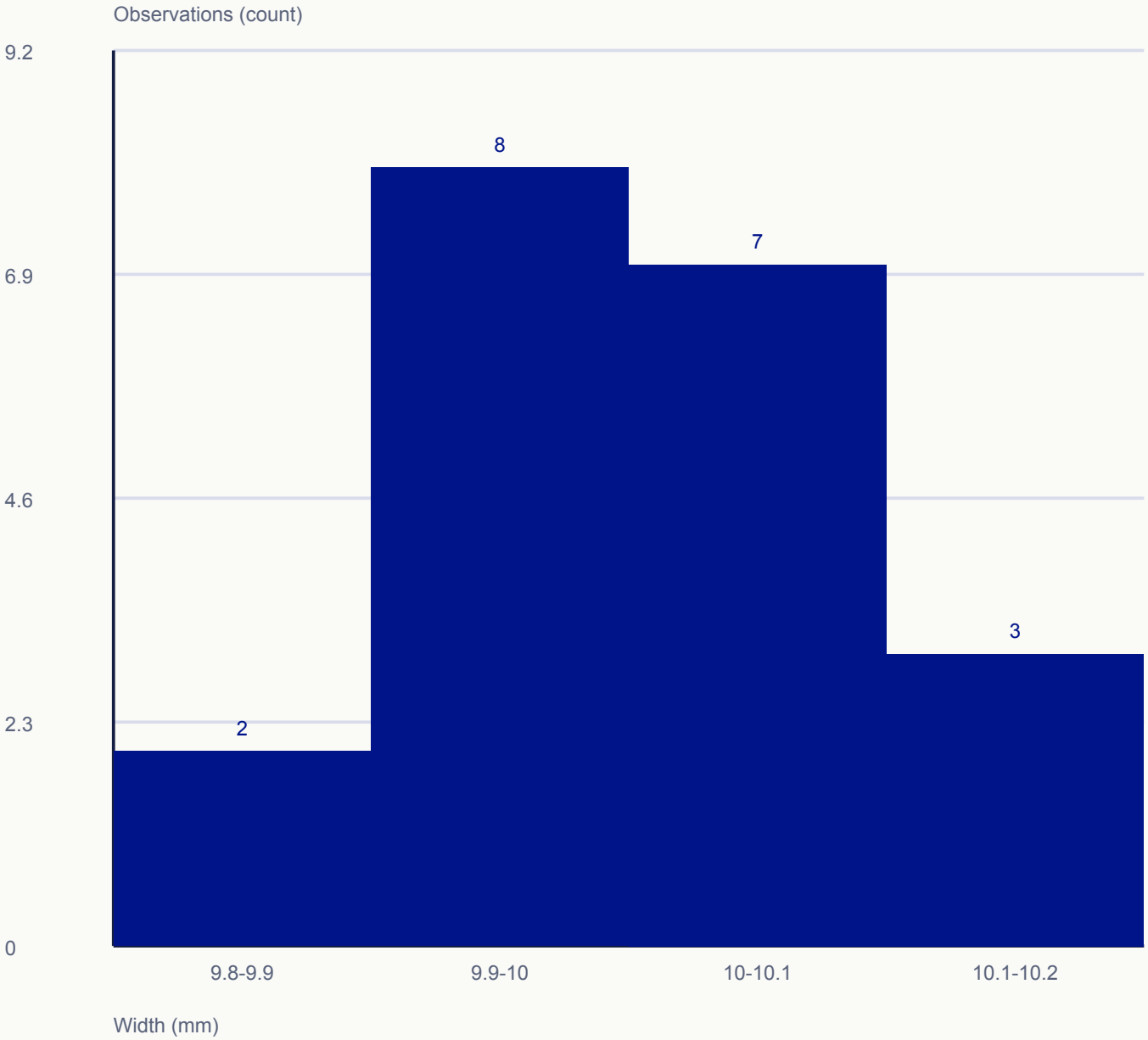
What would change the decision?

The action log records the risk response independently of the improvement-priority list.

See how the method works

A histogram shows how observations occupy intervals of a measurement scale. Define contiguous bin edges and a rule for boundary values so every observation enters exactly one bin. Inspect shape, gaps and unusual values, while remembering that a histogram discards the sequence in which readings occurred. Two humps may suggest mixed sources, but they do not prove which sources are responsible. Keep the original time and source records for follow-up. A visually narrow distribution is also insufficient to establish stability or capability. Those conclusions require appropriate measurement evidence, temporal analysis and stated specification assumptions.

Frequency within declared bins



Left closed, right open; final bin includes 10.2.

20 synthetic observations; no time order or capability conclusion.

20 synthetic observations; no time order or capability conclusion.

05 / Connect the next question to its records

To investigate stability, she retrieves the ordered measurements and operating context. To compare machines, she uses retained source labels rather than interpreting a pooled hump as a machine effect.

Why: The correct next view depends on the question. Repeated rebinning until the shape looks desirable would hide uncertainty instead of resolving it.

Evidence / check: Next analysis names time order or source grouping and the retained evidence it requires.

Completed bin and interpretation record

Check	Completed result	Decision
Count reconciliation	2 + 8 + 7 + 3 =20	No missing or double-counted observations
Boundary 10.00	Third bin only	Apply endpoint convention consistently
Boundary 10.20	Final bin included	Use declared last-bin exception
Middle bins	8 + 7 =15 of 20	Describe sample concentration only
Stability	No time-order display supplied	Retrieve ordered records before assessing behavior

Two sources share the histogram

The records reveal ten observations from each of two machines.

Decision

Keep the pooled distribution but prepare comparable source-separated views using the retained identities. Confirm measurement comparability and exposure before attributing differences.

Reasoning

A pooled shape can conceal different streams. A source label is useful evidence for investigation, not automatic proof that one machine caused the pattern.

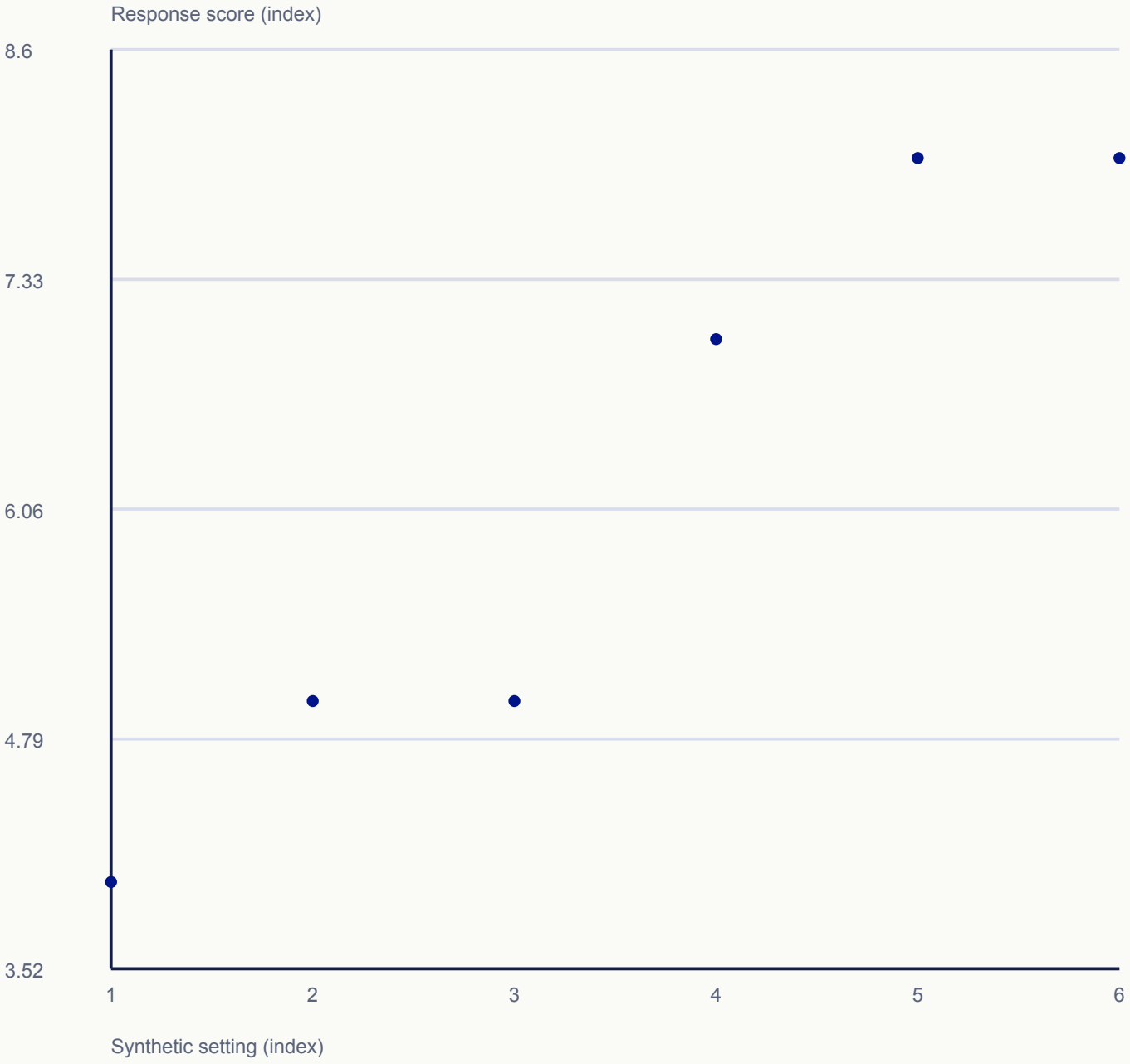
What would change the decision?

The analyst can map each observation back to machine and time.

See how the method works

A scatter plot preserves the pairing between two variables. Label both scales and make clear what one point represents. Pair observations from the same relevant unit or time window; arbitrary pairing can manufacture a pattern. An apparent slope is an invitation to investigate, not proof that changing one variable will change the other. Product mix, time, measurement error or an omitted factor may explain the relationship. Preserve source labels and inspect unusual points before fitting a model. A useful next step is a safe, discriminating test that would produce different predictions under the competing explanations.

Paired observations



Association only; no causal line or fitted prediction.

Association only; no causal line or fitted prediction.

04 / Name competing explanations

He asks whether observation order, a material change or a different operator moved with the setting. The record lacks those contextual fields, so the competing explanations remain open.

Why: A common influence can move both variables. Missing context should become an evidence request, not a convenient assumption that all other conditions were identical.

Evidence / check: The investigation record lists setting effect, order effect and source mix as hypotheses.

05 / Propose an authorized discriminating comparison

For the training exercise he sketches repeated comparisons with randomized order or an appropriate blocked design and consistent measurement. A qualified owner must approve any real experiment and operating range.

Why: An experiment needs a design that separates plausible influences and protects the process. This proposal is a reasoning exercise, not permission to alter equipment or choose a PID setting.

Evidence / check: The next step states what would be held comparable, what would vary and what outcome would challenge the hypothesis.

Completed association-to-test record

Evidence state	Observed or proposed statement	Allowed conclusion
Fact about supplied data	Pairs(1,4),(2,5),(3,5),(4,7),(5,8),(6,8)	Upward association in this set
Hypothesis	Setting may influence response	Needs discriminating evidence
Rival hypothesis	Order or source may affect both	Context not supplied
Next comparison	Approved repeated/blocked or randomized study	Design before intervention

One point was paired to the wrong record

The response 8 originally paired with setting 5 is found to belong to another observation.

Decision

Correct the source pairing with a traceable amendment and replot before interpreting. Retain the original mistaken version as an error record if required locally.

Reasoning

The strength or direction of association depends on correct pairs. A visually convenient point must not remain because it supports the preferred story.

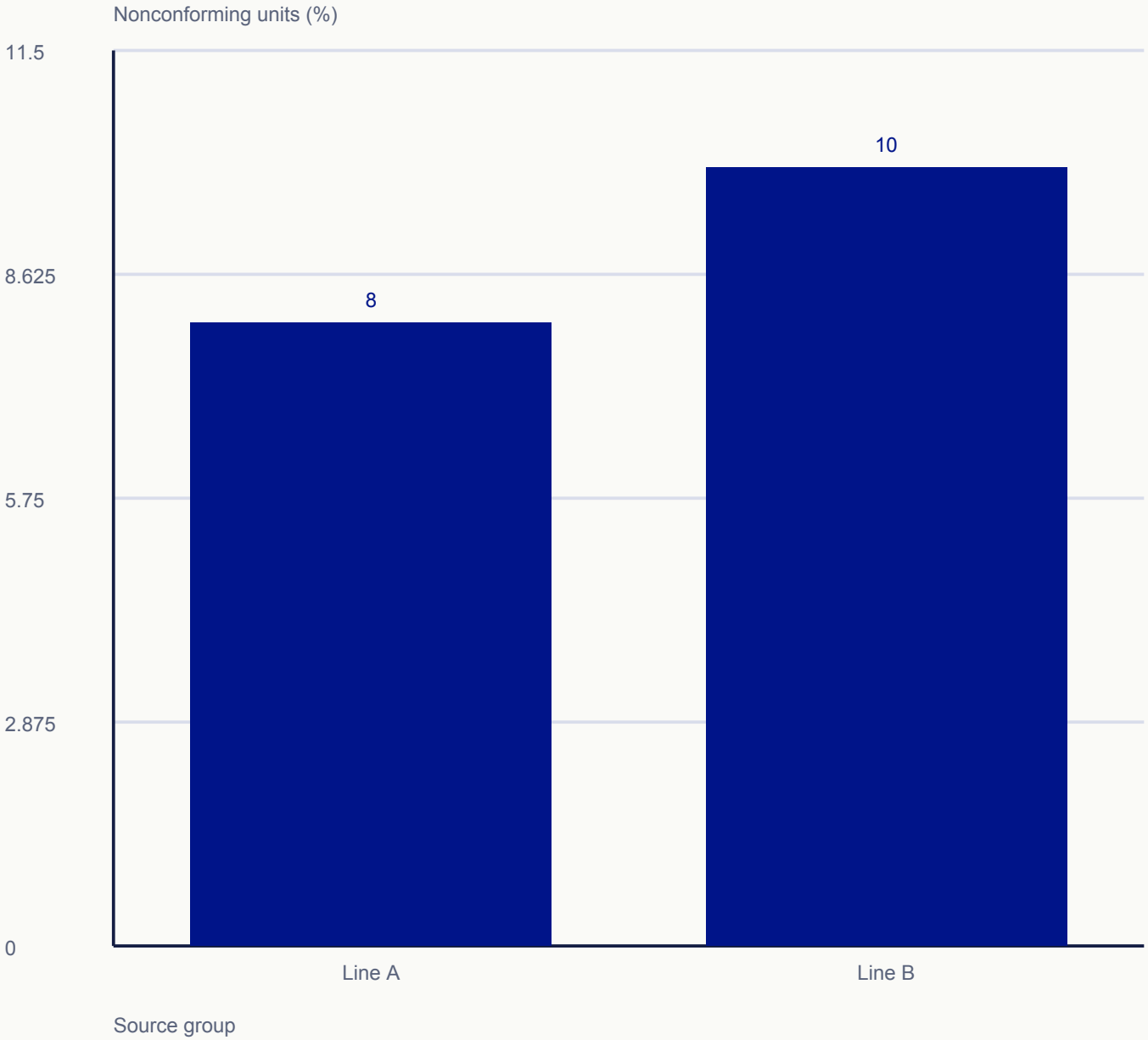
What would change the decision?

The amended observation ID explains which point changed and why.

See how the method works

Stratification keeps meaningful source labels attached to the evidence. Pooling machines, shifts, products or suppliers can conceal patterns and can also create misleading comparisons. Define comparable opportunities before dividing the data into groups. In this example the smaller count belongs to the line with the higher observed nonconforming percentage. That difference still does not prove a line effect: the groups may have different products, inspection methods or random uncertainty. Compare relevant strata, examine the underlying process and retain the pooled view for context. Do not use a convenient grouping as a shortcut for blaming people.

Rates with declared denominators



Denominators: Line A: 8/100, Line B: 2/20

Rates compare denominators; two small groups do not establish causal differences.

Rates compare denominators; two small groups do not establish causal differences.

05 / Choose a proportionate response

Mara pauses the blame-based training assignment and commissions a comparable observation window while responding to actual nonconforming product under its own procedure.

Why: Better comparison does not mean ignoring known product problems. It means keeping product response separate from an unsupported causal claim about a team.

Evidence / check: The action names collection improvements and responsible owners rather than declaring a worse shift.

Completed source comparison

Comparison	Result	Interpretation
Line A	8% from 100 inspected	More failures, lower observed fraction
Line B	10% from 20 inspected	Fewer failures, higher observed fraction
Pooled	8.33% from 120	Weighted mixture, not a line-effect estimate
Cause	Not established	Need comparable product/measurement context

The apparent winner changes within product

A later record shows the two lines made very different product mixes.

Decision

Separate the products where enough comparable observations exist, retain pooled and stratified views, and report gaps where one line has no matching product.

Reasoning

A convenient aggregate can hide or reverse relationships. Do not manufacture comparable groups by discarding inconvenient units without an explicit rule.

What would change the decision?

Each comparison declares its product scope and actual exposure.

See how the method works

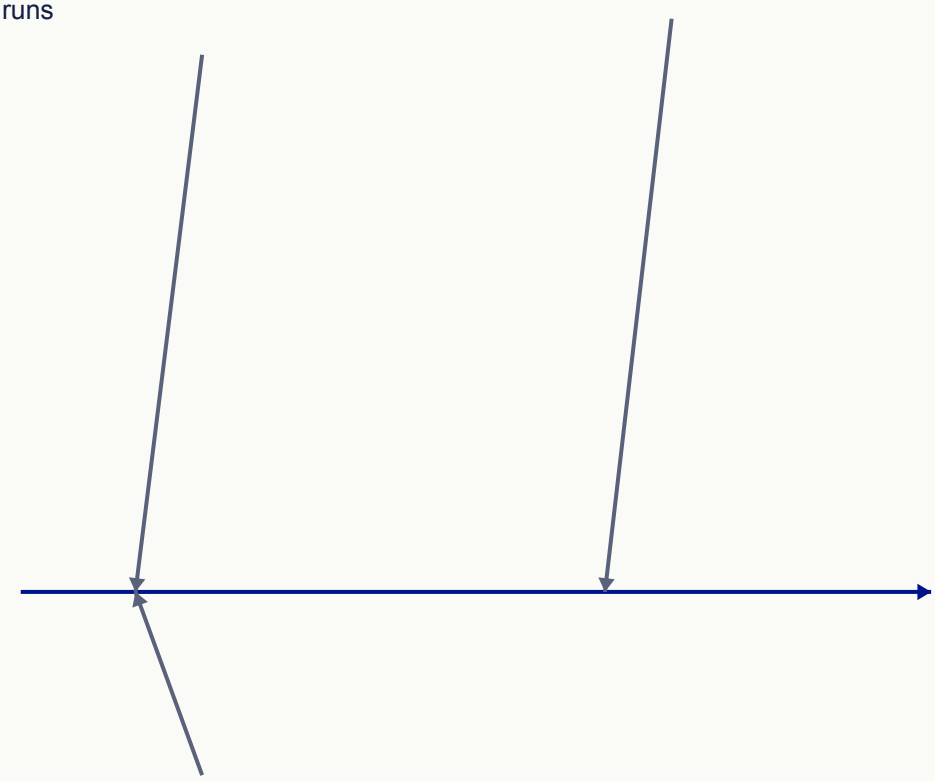
The branches of a fishbone are hypotheses. Begin with one observable effect and a useful scope, then invite several explanations without promoting consensus into proof. Categories help organize discussion; they do not require every branch to be filled or make the resulting list exhaustive. Select important hypotheses and state an observation or test that could distinguish each from an alternative. Mark evidence as observed fact, hypothesis, test result or supported cause. When a test contradicts a branch, update the picture rather than defending the original workshop. A causal conclusion should explain the evidence and survive a relevant verification.

Method

Fixture positioning differs between runs

Material

Input material thickness differs



Seam-width variation

Observed effect / no verified cause

Measurement

Measurement technique differs between observers

All branches are unverified hypotheses

Choose competing explanations and define an authorized comparison with different predicted outcomes.

A fishbone diagram connects the observed seam-width variation to three unverified hypotheses: fixture positioning under Method, input thickness under Material and observer technique under Measurement. The branches organize possible explanations; no cause has been verified.

04 / Record evidence that could contradict the favorite

Before results exist, the team writes that a fixture explanation would be weakened if comparable seam variation persists under verified identical positioning and measurement conditions. It identifies uncontrolled factors that could still confound the comparison.

Why: Predictions written in advance reduce the temptation to reinterpret every outcome as support. A failed prediction is useful learning, not a reason to delete a row.

Evidence / check: The test card contains both supporting and contradicting outcomes.

05 / Update the state and choose the next test

Elena leaves outcomes blank until observations are made. After a reviewed test, the group can label the evidence as supporting, contradicting or inconclusive and decide the next action.

Why: A planned test is not a completed test. Correction or trial action must follow the evidence and relevant authority rather than the appeal of a completed-looking fishbone.

Evidence / check: The record includes result, limitations, decision and next owner without invented observations.

Completed hypothesis-to-test planning record

Hypothesis	Discriminating evidence	Current decision
Observer technique	Same retained samples measured under a defined comparison	Test planned; no outcome supplied
Fixture positioning	Verified positioning records and controlled comparison	Preserve evidence; not proven
Material thickness	Traceable thickness/source records matched to seam observations	Investigate comparability
Overall	No completed tests in supplied case	Zero verified causes

A test result is inconclusive

Observers disagree, but the comparison used different sample locations and unclear measurement instructions.

Decision

Record the result as inconclusive for the intended hypothesis and repair the test method before attributing the effect to operators.

Reasoning

The comparison changed more than the intended factor. An ambiguous test cannot fairly support a specific blame or corrective action.

What would change the decision?

The next plan identifies the same measurand, location and procedure.

See how the method works

Chart selection starts with how data are generated. Measurements taken individually differ from rational subgroups collected under comparable short-term conditions. Nonconforming units differ from nonconformities, because one unit can contain several faults. For attributes, record whether the inspected quantity or exposure changes. These distinctions guide the candidate family: individuals and moving range, subgroup charts, p or np, and c or u. Selection is not complete until independence and model assumptions are considered. Rare events, autocorrelation, changing opportunity and overdispersion may require specialist methods. Choose the sampling plan and interpretation rules before routine monitoring begins.

One measurement per observation

I-MR candidate; retain time order and assess dependence.

Small rational measurement subgroups

Xbar-R candidate; review spread before averages; choose constants by n.

Fraction of nonconforming units

p chart; retain each sample size and binomial assumptions.

Count of nonconforming units at fixed n

np chart; each unit classified once.

Nonconformities at fixed exposure

c chart; one unit may contain multiple faults.

Nonconformities per varying exposure

u chart; keep counts and exposure, check count-model assumptions.

These are candidates, not automatic approvals. Autocorrelation, overdispersion, rare events and unsuitable opportunity definitions may require other methods.

Completed chart-selection record

Record	Candidate	First qualification
A: individual width	I-MR	Time order, dependence and measurement
B: five-unit width subgroup	Xbar-R	Rational subgroup and matching constants
C: pass/fail, varying n	p	Unit classification and sample-specific limits
D: pass/fail, fixed n = 100	np	Constant inspected sample size
E: blemishes, fixed area	c	Comparable fixed opportunity
F: blemishes, varying area	u	Known varying exposure and count-model fit

The denominator is missing

Record C gives rejected units but omits how many were inspected on two days.

Decision

Retrieve the actual denominators before calculating fractions or limits. Mark the missing observations explicitly; do not assume 100 because another row uses 100.

Reasoning

A plausible-looking graph based on invented exposure would communicate false evidence. Another process's denominator is not a substitute.

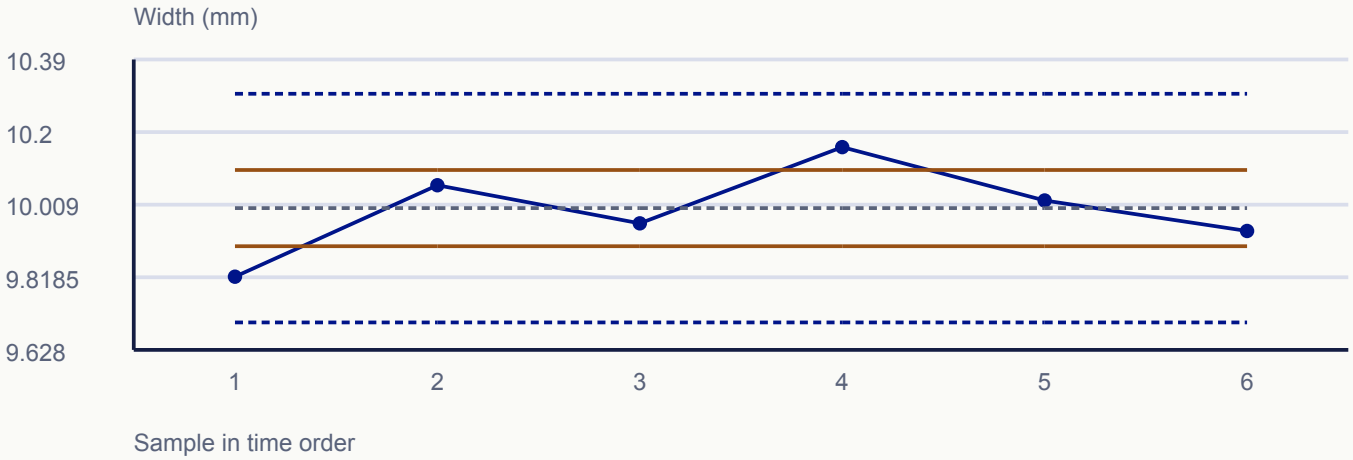
What would change the decision?

The record identifies the two missing sample sizes and their owner.

See how the method works

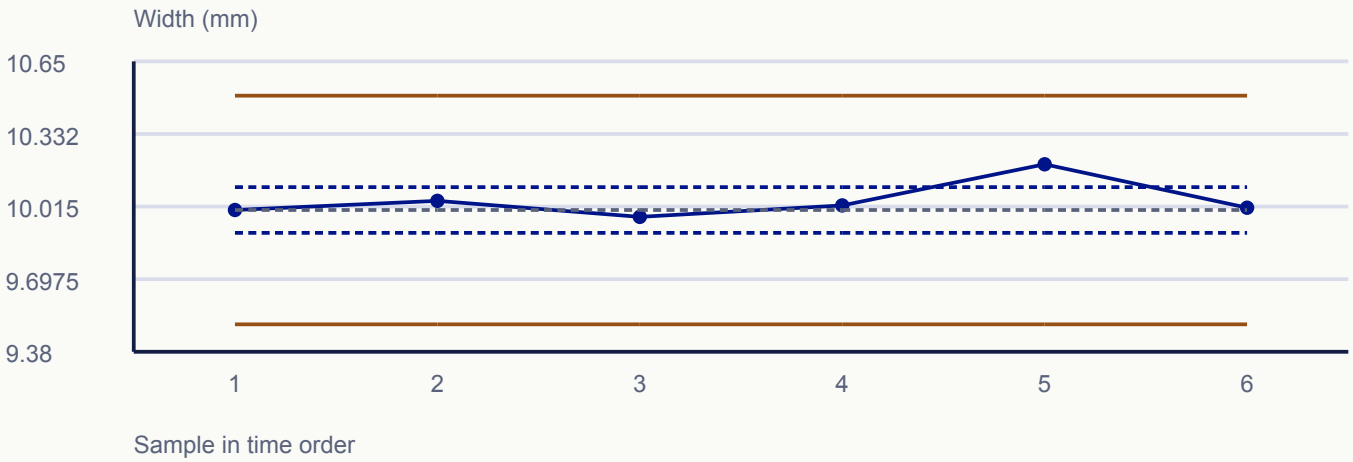
Control limits describe expected process behaviour under a specified baseline model. Specifications express an engineering or customer requirement. They answer different questions and must be labelled differently. A process can behave consistently yet produce unacceptable output because its ordinary variation is too wide or its centre is misplaced. Conversely, a point can be within specification and still signal an unusual process change. Investigate that signal through the approved response instead of accepting it simply because the product passed. Improve the system for common-cause loss; do not continually adjust settings to chase ordinary noise. Stability must be assessed from suitable evidence, not a handful of decorative points.

Stable baseline can miss specification



Center: 10
LCL: 9.7
UCL: 10.3
Spec lower: 9.9
Spec upper: 10.1

A signal can remain within specification



Center: 10
LCL: 9.9
UCL: 10.1
Spec lower: 9.5
Spec upper: 10.5

Baseline stability is supplied for teaching; six points do not establish stability. Only beyond-limit rule illustrated; point 5 in panel 2 is the signal.

Baseline stability is supplied for teaching; six points do not establish stability. Only beyond-limit rule illustrated; point 5 in panel 2 is the signal.

Two decisions for the same observations

Observation	Specification decision	Chart decision / response
A sample 1:9.82 mm	Below 9.90; nonconforming	Within 9.70-10.30; disposition required
A sample 4:10.16 mm	Above 10.10; nonconforming	No beyond-limit point; improve baseline suitability
B sample 5:10.20 mm	Within 9.50-10.50	Above UCL 10.10; investigate signal
All six points	Not a full output release	Do not infer stability from this short display

The baseline belongs to a different setup

Sam learns that process B changed tooling before sample 1, and the owner has not confirmed whether the supplied baseline remains applicable.

Decision

Keep the observation and prior signal comparison visible, but mark interpretation provisional and escalate baseline suitability. Continue the applicable product controls; do not create new limits from six points.

Reasoning

A control limit is meaningful only for the process and statistic it represents. A baseline problem is not resolved by substituting specification limits.

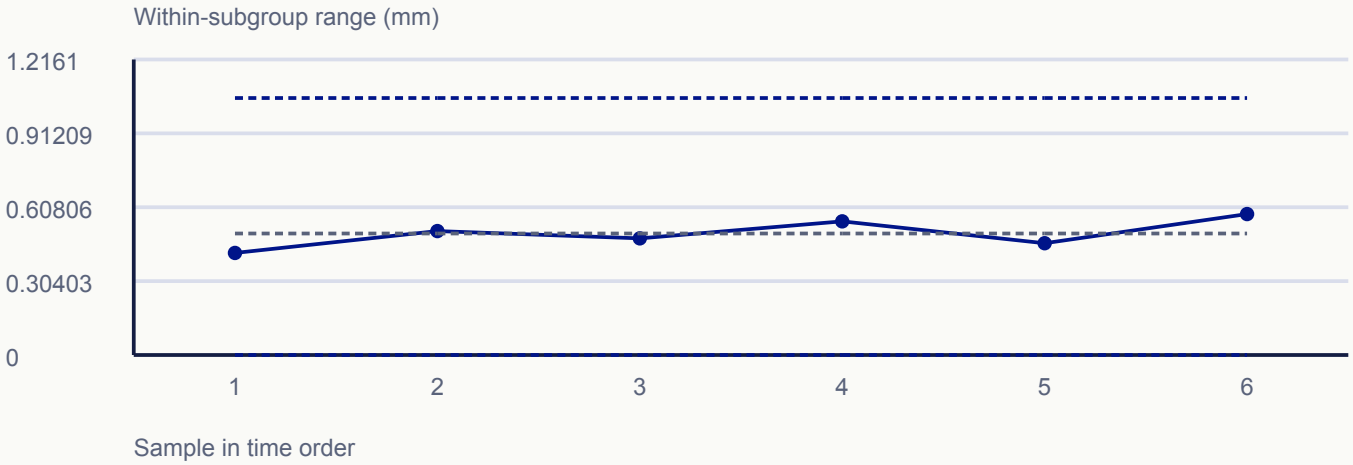
What would change the decision?

Tool-change time, approved chart definition, measurement record and suitable process history are required.

See how the method works

A rational subgroup is intended to expose short-term variation while preserving meaningful changes between samples. For this example each subgroup contains five readings taken under comparable conditions. The range chart helps assess whether that within-subgroup spread is behaving consistently. Review it before interpreting the average chart, whose limits depend on that variation estimate. Constants must match the subgroup size and the chosen method. The displayed points illustrate reading the charts; they do not establish the historical baseline. Do not delete awkward samples merely to obtain attractive limits. Document investigations and use an authorized approach when the underlying process changes.

Read range first

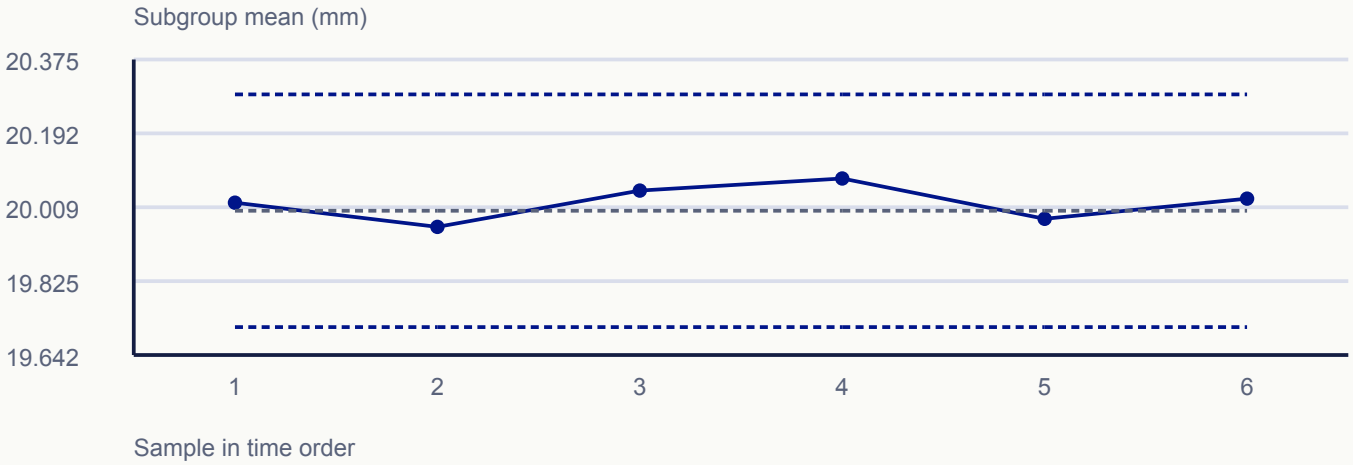


Center: 0.5

LCL: 0

UCL: 1.0575

Then subgroup average



Center: 20

LCL: 19.7115

UCL: 20.2885

Xbar limits = 20 ± 0.577 x 0.5

R limits = 0 x 0.5 and 2.115 x 0.5

Given historical grand mean 20 mm and Rbar 0.5 mm; n=5. The six plotted subgroups are illustrations, not the baseline estimate.

Given historical grand mean 20 mm and Rbar 0.5 mm; n=5. The six plotted subgroups are illustrations, not the baseline estimate.

05 / Plan the signal response

She prepares a record for subgroup identity, raw values, measurement checks, relevant changes and authorized containment/investigation. Limits stay frozen unless a justified baseline review approves a change.

Why: Widening a limit to absorb a signal would conceal the condition. Investigation must preserve the original signal and distinguish correction from learning about its cause.

Evidence / check: The reaction record names the process and quality owners and the next verification.

Completed baseline-to-observation record

Calculation or review	Result	Meaning
Mean limits	19.7115 to 20.2885 mm	From supplied historical parameters
Range limits	0 to 1.0575 mm	n=5 constants
Six range points	All within displayed limits	No beyond-limit point in this illustration
Six mean points	All within displayed limits	Not proof of capability or a new stable baseline

Range signals while mean stays near center

A later fictional subgroup has mean 20.02 mm and range 1.20 mm.

Decision

Record the range signal because 1.20 exceeds 1.0575; preserve the subgroup data and follow the authorized response before treating the near-center mean as reassuring.

Reasoning

A normal-looking average can hide increased within-group spread. The mean does not cancel the range signal.

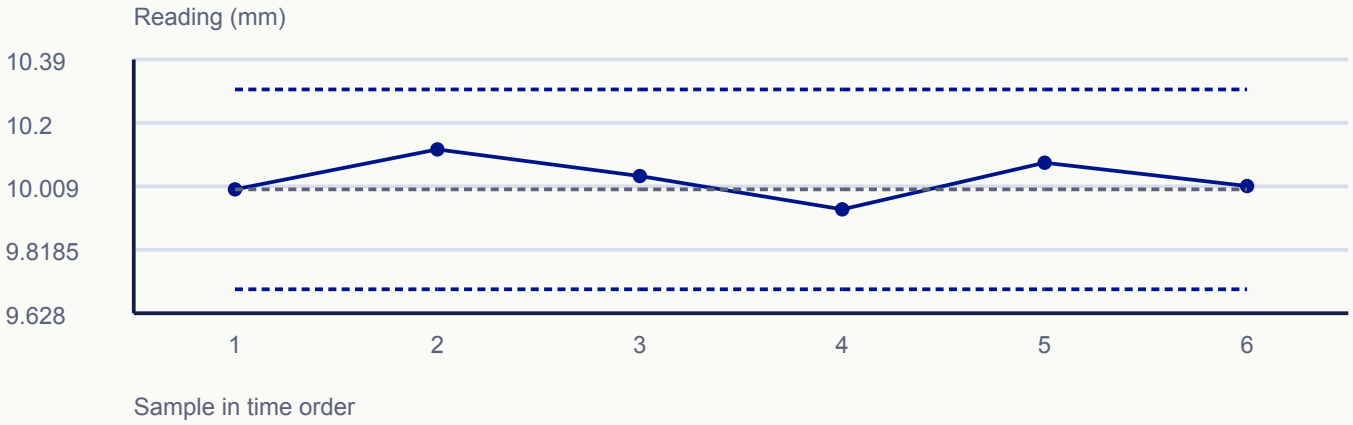
What would change the decision?

The signal record includes the 1.20 mm range and original historical limit.

See how the method works

When only one measurement is available at each observation time, an individuals chart may be appropriate. The moving range uses the absolute difference between adjacent readings in their original order. Sorting values before taking differences destroys the time structure and understates what the process experienced. In this example the historical moving-range average estimates a short-term standard deviation using the stated constant. The short plotted sequence is illustrative and is not used to estimate that baseline. Check dependence, measurement fitness and process context before adopting the method. A signal should trigger the defined investigation; it is not automatically a command to adjust equipment.

Individuals

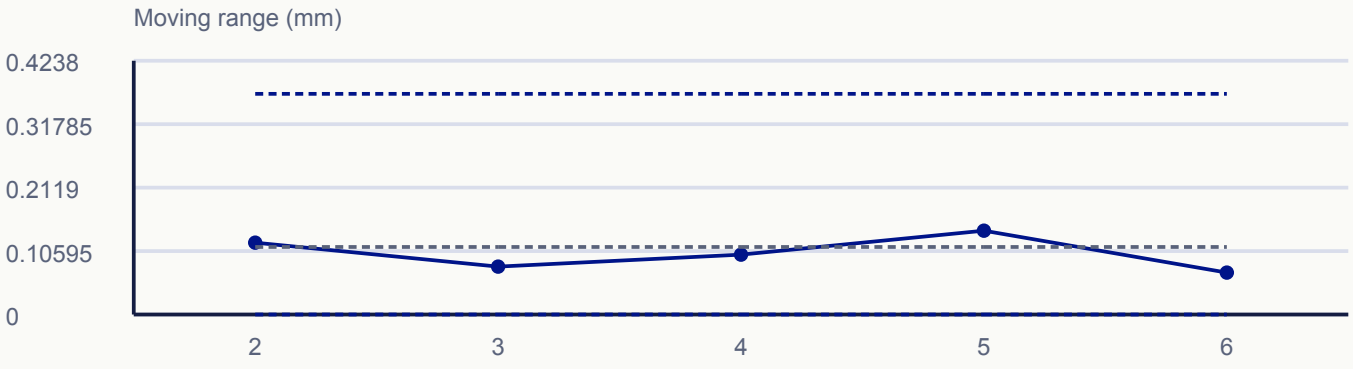


Center: 10

LCL: 9.7

UCL: 10.3

Adjacent moving ranges



Center: 0.1128

LCL: 0

UCL: 0.368518

sigma = 0.1128 / 1.128 = 0.1

I limits = 10 ± 3 x 0.1

MR UCL = 3.267 x 0.1128 = 0.3685176

Given historical mean 10 and MRbar 0.1128; plotted six readings do not estimate this baseline. Adjacent plotted moving ranges are exact absolute differences.

Given historical mean 10 and MRbar 0.1128; plotted six readings do not estimate this baseline. Adjacent plotted moving ranges are exact absolute differences.

05 / Prepare a traceable reaction

For any signal he records the batch pair, measurement condition, known changes and authorized response. He does not convert a positive error or large range into a knob-turning instruction.

Why: A chart detects evidence worth investigating; the process authority determines safe containment, correction and restart. Preserving the original result supports learning about causes.

Evidence / check: The response record contains observations and roles, with no invented operating command.

Completed time-order monitoring record

Record item	Result	Evidence boundary
Sigma from historical MRbar	.10 mm	Supplied baseline calculation
Individuals limits	9.70-10.30 mm	Not specification limits
MR limits	0-.3685176 mm	Adjacent-pair spread
Later illustration	Six readings; five ranges	Not a newly estimated baseline

A new reading jumps to 10.50 mm

After the last illustrative reading 10.01 mm, the next fictional observation is 10.50 mm.

Decision

Record both the individuals signal 10.50>10.30 and moving range .49>.3685176. Retain both batch identities and follow the approved abnormality response.

Reasoning

The moving range links the jump to its neighbor; it does not identify which physical cause produced it.

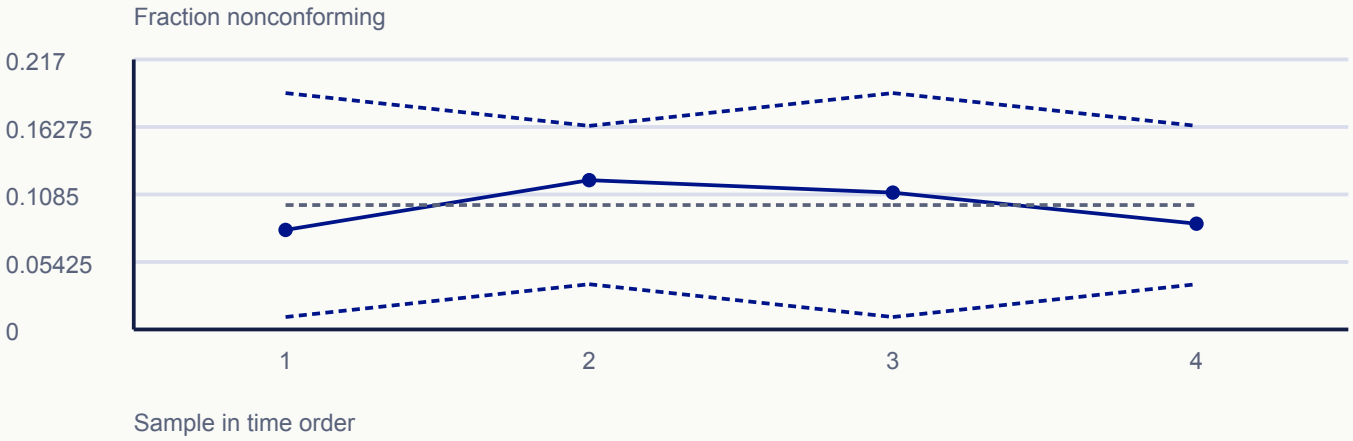
What would change the decision?

Two signals are recorded against the same unchanged baseline.

See how the method works

For nonconforming units, every inspected unit contributes at most one failure to the count. A p chart displays the fraction nonconforming and can accommodate different sample sizes with different limits. An np chart displays the count and assumes a constant sample size in this basic form. A larger sample narrows the p-chart limits because it changes the expected sampling variation; it does not change the customer specification. Estimate the baseline from appropriate totals and retain each denominator. The example uses a supplied baseline proportion. Dependence, changing product mix and unsuitable binomial assumptions require investigation rather than blind application of these formulas.

p: sample size may vary / n: 100, 200, 100, 200

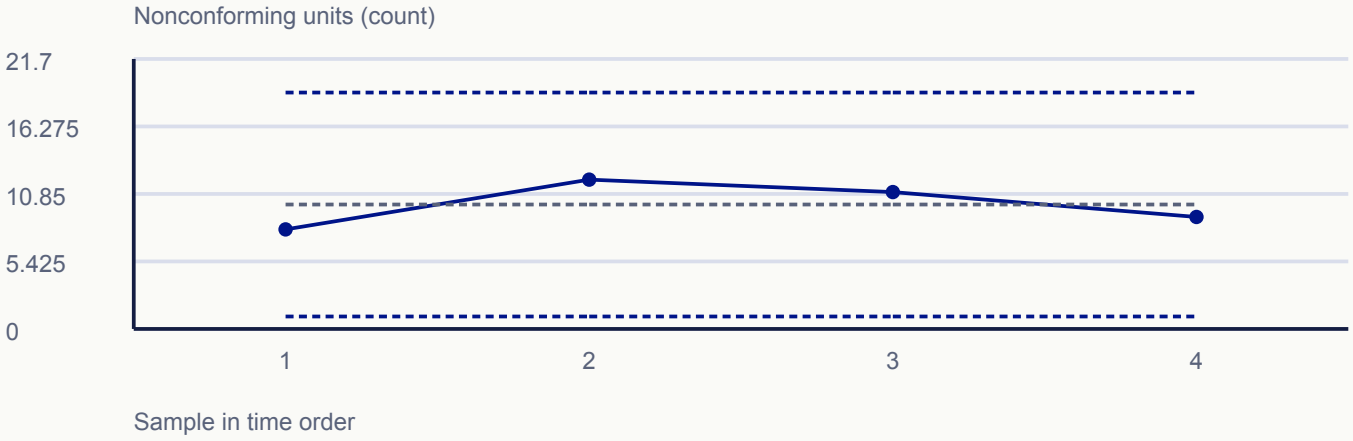


Center: 0.1

LCL: 0.01 / 0.0363604

UCL: 0.19 / 0.16364

np: fixed sample size 100 / n: 100, 100, 100, 100



Center: 10

LCL: 1

UCL: 19

p limits = pbar ± 3 sqrt(pbar(1-pbar)/n)

np limits = n pbar ± 3 sqrt(n pbar(1-pbar))

Restrict displayed p limits to [0,1] and np limits to [0,n] when the basic formula exceeds possible values.

Given baseline pbar=0.10. Each unit classified once. Per-point p limits vary with n; np example uses constant n.

Given baseline pbar=0.10. Each unit classified once. Per-point p limits vary with n; np example uses constant n.

05 / Record a response rather than a verdict

Pia documents any signal against the supplied baseline and checks measurement, sampling and process context. Product containment and release follow the applicable quality procedure.

Why: A point within statistical limits is not proof that the defect level is acceptable. A signal identifies changed behavior worth responding to, not its cause.

Evidence / check: The record separates chart evidence, product decisions and investigation ownership.

Completed denominator-to-limit record

Display	Baseline / limits	Meaning
p at n100	Center .10; .01-.19	Fraction of inspected units
p at n200	Center .10; .03636-.16364	Narrower fraction limits
np at fixed n100	Center 10;1-19	Count of nonconforming units
Interpretation	No cause or acceptance verdict	Use the declared response plan

Inspection amount changes on the np record

A busy shift inspects 200 instead of 100 and enters 20 in the count chart.

Decision

Retain 20/200=.10 and handle the sampling-design change through the chart owner; do not compare 20 directly with the old fixed-n100 upper limit 19.

Reasoning

The change in denominator alone can explain the count increase. The original chart was designed for fixed n.

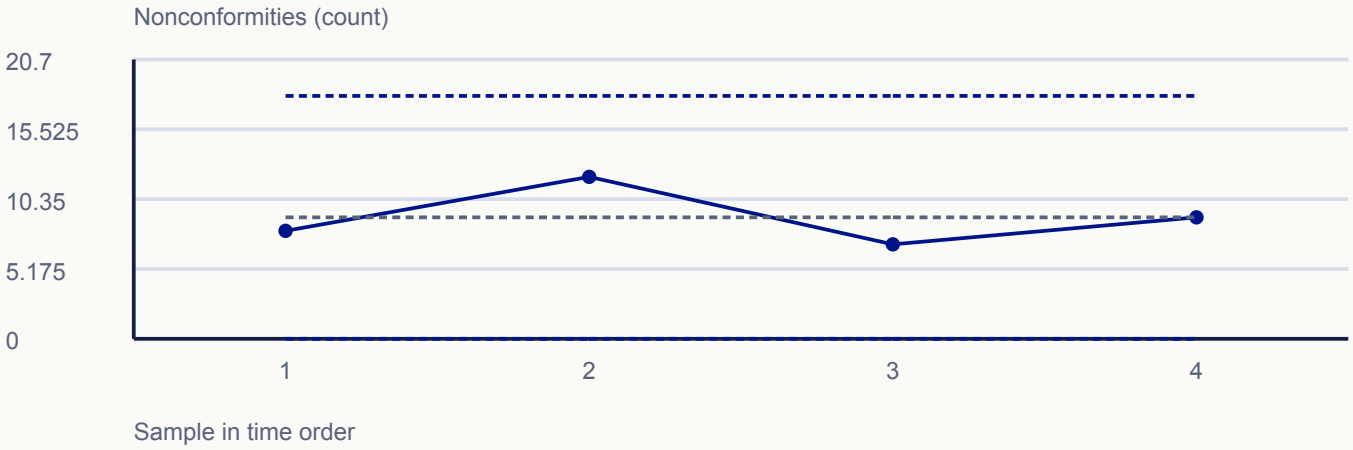
What would change the decision?

The observation is preserved with n200 and a documented display/design decision.

See how the method works

A nonconformity count is not restricted to one per product. A c chart is a basic candidate when inspection exposure and opportunity are comparable. A u chart expresses nonconformities per unit of exposure when the amount inspected varies. Keep the original count and exposure with every point so the displayed rate can be checked. The basic formulas rely on a suitable count model; clustering, changing opportunity and very low expected counts can invalidate a casual interpretation. Do not compare rates from incompatible definitions of area, time or opportunity. The two panels here describe separate fictional baselines and should not be combined into one process.

c: equal exposure / Exposure: 1, 1, 1, 1 equal units

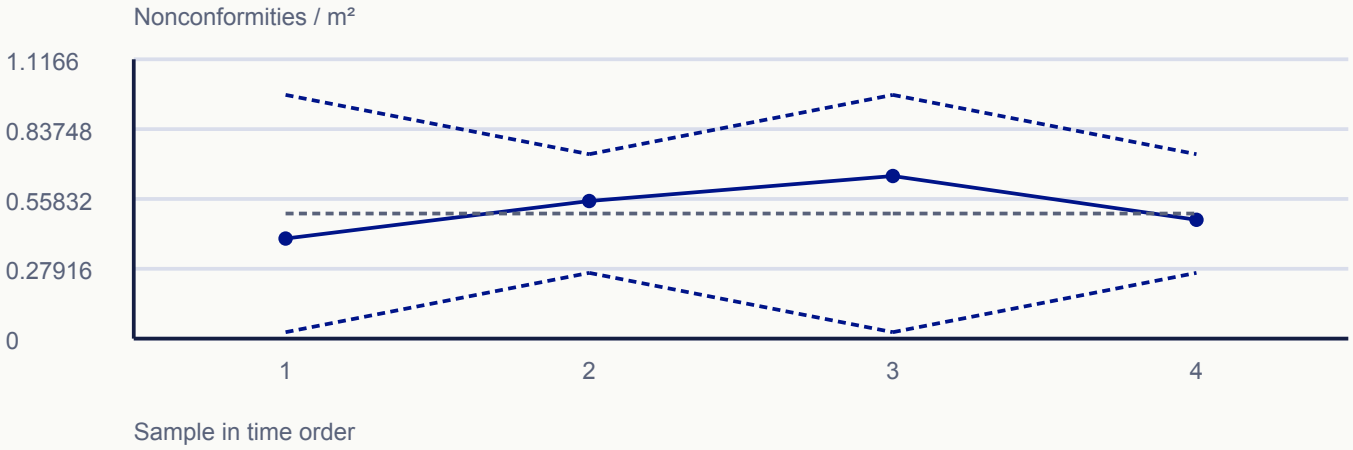


Center: 9

LCL: 0

UCL: 18

u: variable exposure / Exposure: 20, 80, 20, 80 m²



Center: 0.5

LCL: 0.0256584 / 0.262829

UCL: 0.974342 / 0.737171

c limits = 9 ± 3 sqrt(9), lower clamped to 0

u limits = 0.5 ± 3 sqrt(0.5 / exposure)

Given cbar=9 at fixed exposure and ubar=0.5/m². Separate fictional processes. Poisson model requires suitable opportunity and independent events.

Given cbar=9 at fixed exposure and ubar=0.5/m². Separate fictional processes. Poisson model requires suitable opportunity and independent events.

05 / Qualify the interpretation and response

Hugo checks whether blemishes cluster or opportunities differ by product/area. He records signals and asks the owner to review the model if those conditions undermine it.

Why: A computed limit is not proof that the count model fits. A response should preserve the event and exposure records and use authorized product/operating decisions.

Evidence / check: The investigation separates model adequacy, signal evidence and disposition authority.

Completed opportunity-to-rate record

Case	Calculation	Interpretation
Fixed exposure c	9 ±3√9 =0-18	Counts for a separate supplied baseline
u, area 20	.5 ±3√(.5/20)	.02566-.97434 per m²
u, area 80	.5 ±3√(.5/80)	.26283-.73717 per m²
Sample comparison	.65 at 20 vs .55 at 80	Rate and uncertainty both matter

Inspection includes a different surface type

An 80 m² observation combines a smooth coating with a textured surface having different inspection difficulty and opportunity.

Decision

Preserve the record and review stratification and opportunity definitions before treating the combined area as comparable exposure.

Reasoning

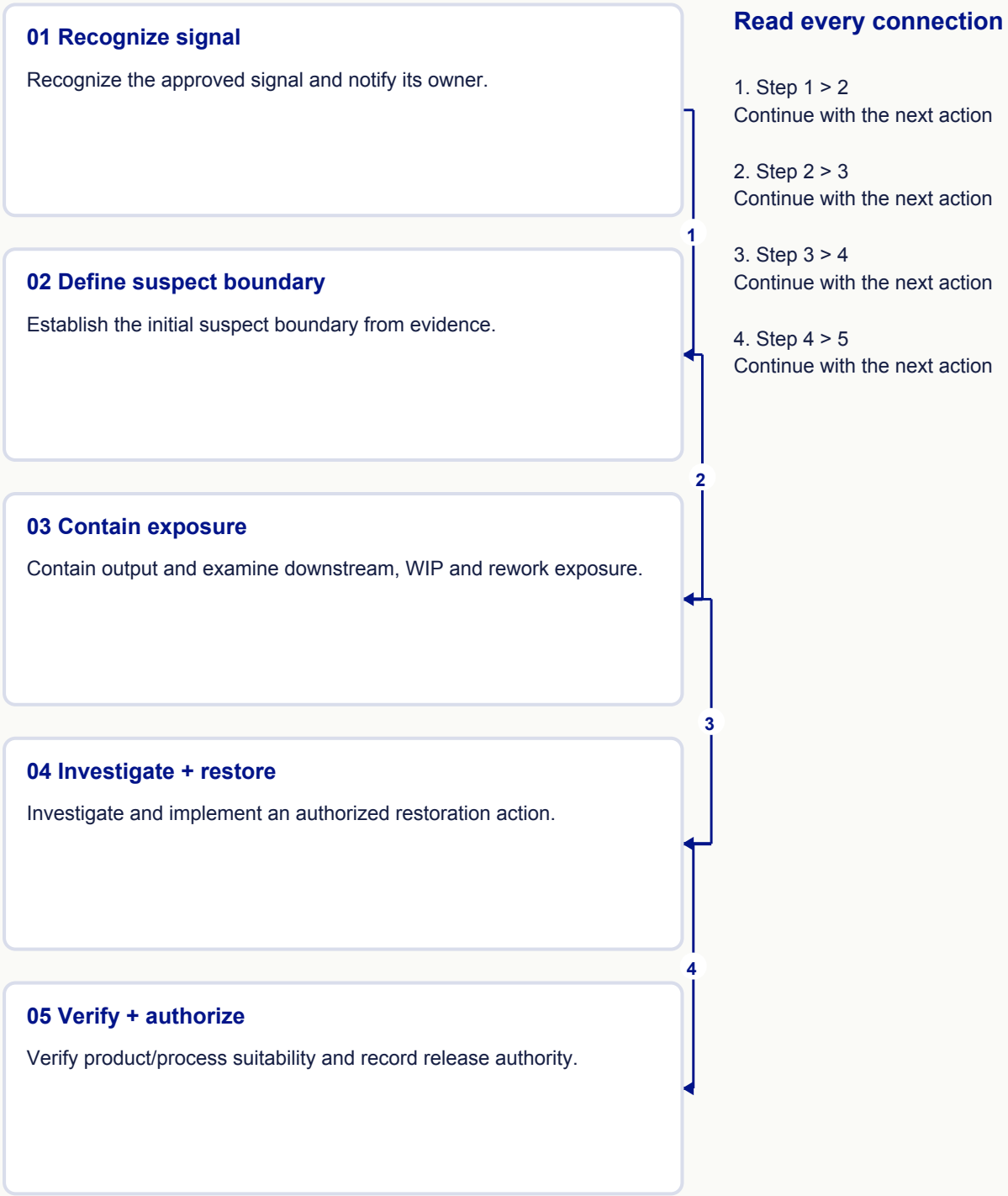
A numerical area alone may not represent equivalent opportunity. A larger denominator can conceal a collection or process mixture.

What would change the decision?

The revised collection plan identifies surface type and comparable exposure.

See how the method works

A signal is useful only when the response is clear. An out-of-control action plan identifies who recognizes the abnormality, who contains potentially affected output, how evidence is preserved and who can authorize restoration. Start with a justified suspect boundary, then examine downstream stock, rework and other exposure that may extend it. Do not confuse quarantining product with correcting the underlying process. Investigate using time, settings and lot identity, implement an authorized action and verify that the process and product are suitable before release. Update the control plan when learning changes the required response. The boundary here is an arithmetic illustration, not a universal containment rule.



Method exhibit: Recognize signal, Define suspect boundary, Contain exposure, Investigate + restore, Verify + authorize.

Initial containment reconciliation - fictional event OC14

Scope	Count / location	Owner / decision
101-110	10 packed, not shipped	Packing lead: hold acknowledged
111-125	15 downstream queue	Downstream lead: hold acknowledged
126-140	15 at cell / WIP	Cell lead: hold acknowledged
101-140	40 unique units	Quality: provisional boundary
Release	Pending disposition evidence	Authorized quality decision; not restart alone

The checkpoint cannot be trusted

The measurement-status review finds that the serial 100 check cannot be accepted. The preceding valid checkpoint is serial 80. Records locate 81-100 as 20 additional packed units.

Decision

Expand the initial suspect interval to 81-140:60 units. Add the 20 newly identified units to the controlled scope and reassess downstream exposure.

Reasoning

60 =140 minus 81 plus 1; the previous 40 remain included. The new evidence changes the boundary, not just the label on the old hold.

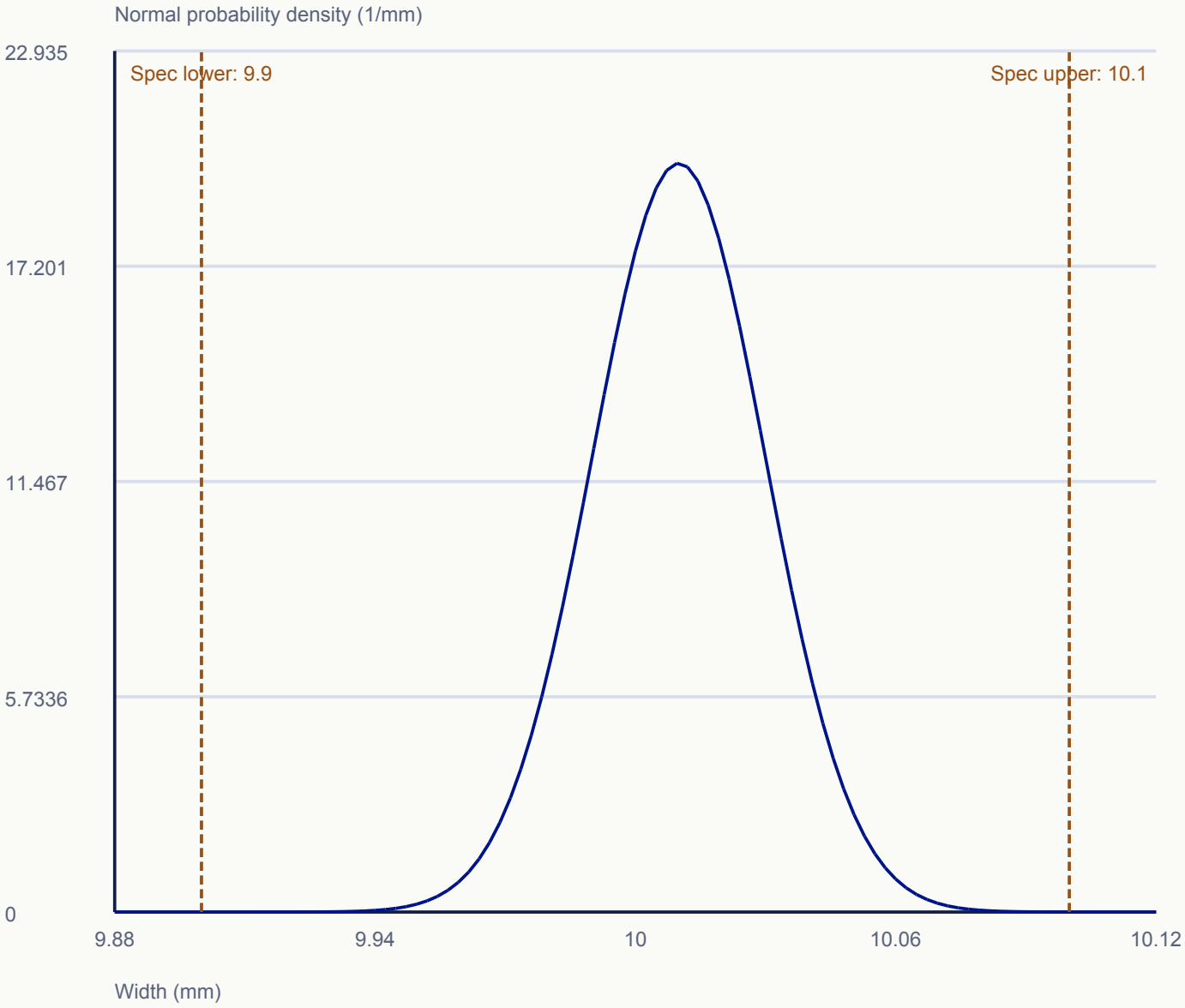
What would change the decision?

The revised map cites why checkpoint 100 was rejected, retains checkpoint 80 evidence and reconciles all 60 unique serials.

See how the method works

Capability compares a process distribution with stated specification limits. First establish that measurement is fit for the decision and that the process behaviour supports the chosen analysis. Cp compares specification width with six estimated standard deviations; Cpk also reflects how far the mean lies from the nearer specification. An attractive number does not cure instability, establish an applicable customer threshold or remove sampling uncertainty. State the estimator, distribution assumptions and study conditions when reporting results. This example supplies stable-normal parameters solely to demonstrate arithmetic. It is not evidence that a real process is qualified, approved or certain to produce no nonconforming output.

Supplied stable normal model / mean 10.01, sigma 0.02



Cp = (10.1 - 9.9) / (6 x 0.02) = 1.667

Cpk = min(10.1 - 10.01, 10.01 - 9.9) / (3 x 0.02) = 1.500

Synthetic supplied stable-normal parameters. Specification lines only; this is not an SPC chart. No universal pass threshold.

Synthetic supplied stable-normal parameters. Specification lines only; this is not an SPC chart. No universal pass threshold.

05 / Write a bounded decision

Asha reports the two indices under the stated assumptions and requests applicable acceptance requirements and appropriate uncertainty/evidence before a production decision.

Why: Neither number is a universal pass threshold. A capability calculation does not replace process control, customer conditions or the authorized release record.

Evidence / check: The report states synthetic calculation only and separates interpretation from acceptance.

Completed capability interpretation record

Calculation	Result	Interpretation
Specification width	.20 mm	External requirement range
Cp	.20/.12=1.667	Spread-only comparison
Nearer mean-to-limit distance	.09 mm upper side	Mean is off-center
Cpk	.09/.06=1.500	Nearer-side comparison
Acceptance	Not established	Applicable criteria and evidence required

The same spread drifts toward the upper limit

In a hypothetical comparison the mean becomes 10.07 mm while sigma remains .02 mm and specifications stay unchanged.

Decision

Cp remains 1.667; Cpk becomes .03/.06=.50. Treat any real drift through process investigation rather than celebrating the unchanged Cp.

Reasoning

The spread-only ratio cannot reveal loss of centering. A changing real process also challenges the stable-distribution premise.

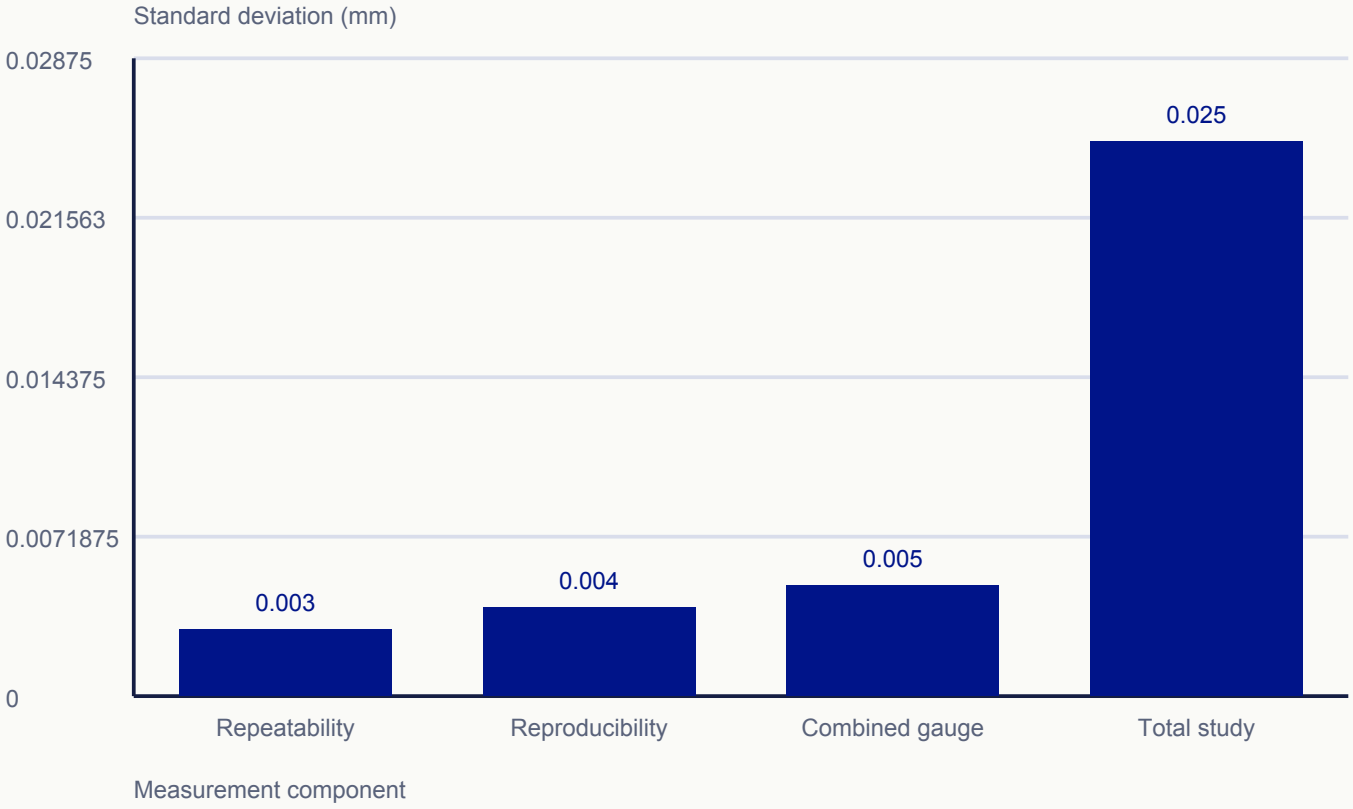
What would change the decision?

The comparison identifies changed mean, unchanged spread and reduced nearer-side margin.

See how the method works

A measurement study separates variation due to the measurement system from variation between parts. Select parts and conditions that represent the intended use, and use a design appropriate to whether repeated measurements are possible. Randomized, blinded repeats reduce memory and order effects. Repeatability and reproducibility are distinct components; estimated independent variances combine before taking a square root. Consequently, a percentage based on standard deviations is not the same as a percentage of variance. Do not treat a sample design or a generic percentage as a universal acceptance criterion. Interpret the result against the measurement decision, risk, resolution and other relevant sources of measurement error.

Supplied standard deviations (mm)



20%
Study variation ratio / % of total SD

4%
Variance contribution / % of total variance

sqrt(0.003² + 0.004²) = 0.005 mm

100 x 0.005 / 0.025 = 20%

100 x 0.005² / 0.025² = 4%

Independent estimated variance components are supplied. Combine variances, not SDs; two percentages have different denominators. No acceptance threshold implied.

Independent estimated variance components are supplied. Combine variances, not SDs; two percentages have different denominators. No acceptance threshold implied.

04 / Label the two denominators

Gauge SD divided by total SD is .005/.025=.20 or 20%. Gauge variance divided by total variance is .000025/.000625=.04 or 4%.

Why: The two percentages answer different questions and are mathematically consistent. A common study-variation multiplier cancels when applied to both numerator and denominator.

Evidence / check: The report labels percent of total SD separately from percent of total variance.

05 / Interpret fitness with the missing context

Eve requests the fitted-model details, representative data and applicable decision criteria. She also considers bias, resolution, stability and other measurement effects beyond repeatability/reproducibility.

Why: A small variance ratio alone does not establish every aspect of measurement fitness. Calibration status and repeatability are related evidence, not interchangeable approvals.

Evidence / check: The conclusion reports the supplied arithmetic and lists the remaining fitness evidence.

Completed measurement-component record

Quantity	Calculation	Result
Gauge variance	$.003^2 + .004^2$	$.000025 mm^2$
Gauge SD	$\sqrt{.000025}$	.005 mm
Share of total SD	.005/.025	20%
Share of total variance	$.005^2/.025^2$	4%
Fitness decision	Applicable requirements and complete study	Not established here

The selected parts cover almost no process range

The ten study parts were all chosen from one narrow group, unlike the range encountered in normal inspection.

Decision

Review and redesign the representative-artifact selection before interpreting the ratio as evidence for normal production decisions. Preserve the original study scope.

Reasoning

The denominator and apparent relative variation depend on the study population. A ratio from an artificially narrow range can be misleading for the intended use.

What would change the decision?

The revised plan explains how selected artifacts represent the measurement task.

See how the method works

Overall agreement can conceal the error that matters most. Establish a defensible reference classification and include representative, difficult items. A full attribute study uses blinded repeats and multiple appraisers to examine consistency within people, between people and against the reference. The single matrix here illustrates denominator choices only. False acceptance asks what fraction of reference-bad items escaped; false rejection asks what fraction of reference-good items were rejected. Both differ from overall agreement. Report the counts and uncertainty rather than declaring success from one percentage. A reference itself can be uncertain, so unresolved classifications need an explicit adjudication method.

	Classified reject	Classified accept
Reference bad	**18 items**	**2 items**
Reference good	**1 item**	**19 items**

Overall agreement: 37/40 = 92.5%

False acceptance among bad: 2/20 = 10%

False rejection among good: 1/20 = 5%

One illustrative pass only. Within-appraiser repeatability requires blinded repeated classifications.

One illustrative pass only. Within-appraiser repeatability requires blinded repeated classifications.

05 / Design the next evidence

The coach plans blinded repeat classifications and, where appropriate, other appraisers using representative cases including difficult boundaries. Prior answers are not shown during repeat assessment.

Why: Within-appraiser consistency, between-appraiser agreement and reference agreement are different questions. Repetition must be designed to measure them rather than rehearse remembered labels.

Evidence / check: The next study plan states the comparison and keeps its results blank until performed.

Completed classification interpretation record

Measure	Calculation	What it establishes here
Overall agreement	37/40=92.5%	Single-pass reference matches
False acceptance among bad	2/20=10%	Error direction in selected bad group
False rejection among good	1/20=5%	Error direction in selected good group
Repeatability	No repeated pass supplied	Not established

Reference status is disputed

One item marked reference-bad has conflicting expert assessments and no resolved decision rule.

Decision

Resolve or explicitly classify the reference uncertainty before using that item to score an appraiser's correctness. Preserve the disagreement as useful method evidence.

Reasoning

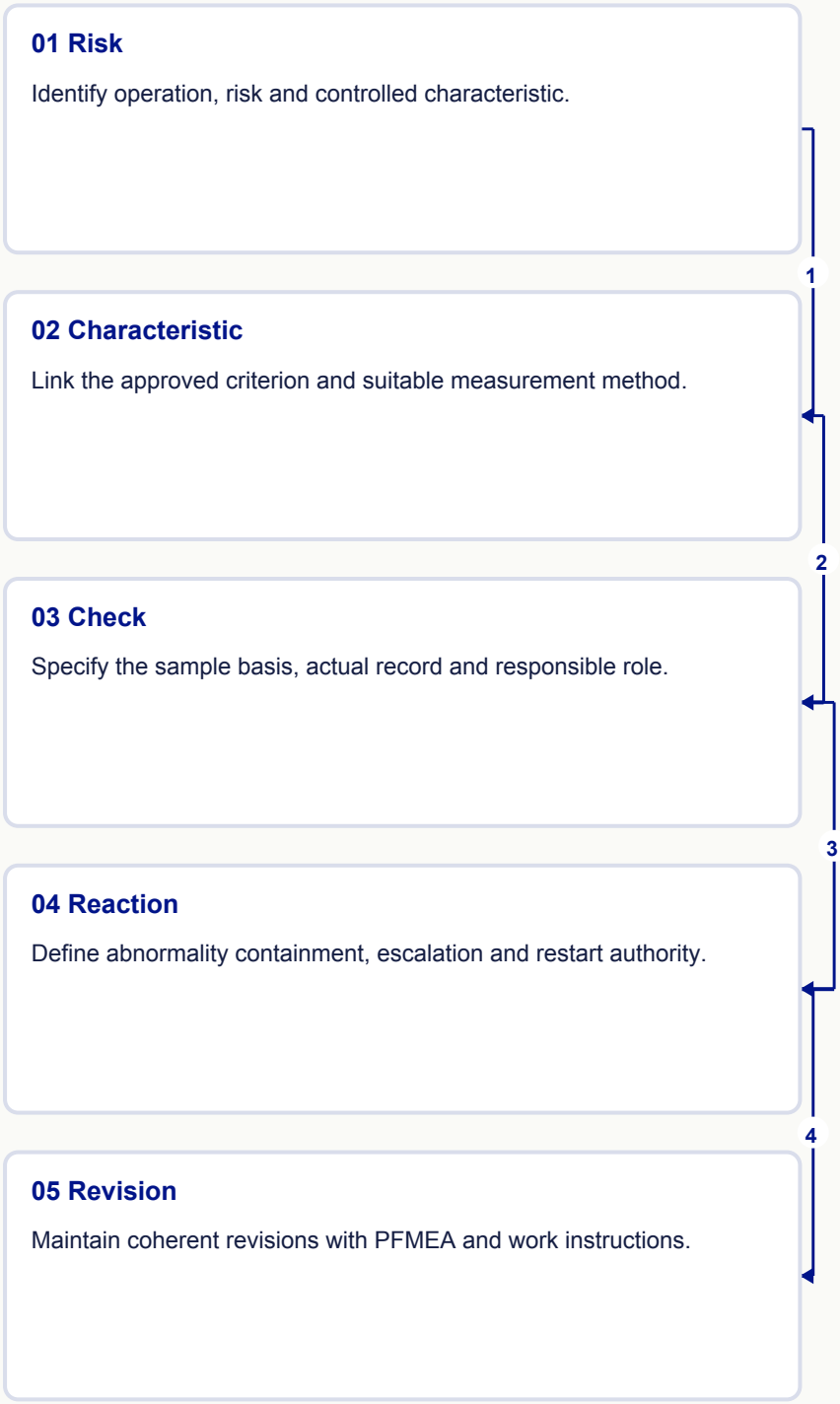
A forced reference label could turn legitimate ambiguity into an apparent operator failure. This is a method-definition issue as well as a training question.

What would change the decision?

The study record states reference uncertainty and the responsible adjudication process.

See how the method works

A control plan connects a process risk to an executable check and response. Link the operation and characteristic to an approved criterion, suitable measuring method, sample basis and retained record. Identify who performs the check and who handles an abnormal result. Sampling should support the intended detection and containment strategy; a convenient interval alone is not a rationale. Maintain links to the process risk analysis, work instruction and revision history so changes remain coherent. The example row is an original teaching device, not an official customer form. A completed row does not establish compliance or authorize production without the applicable review and approval.



Read every connection

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Continue with the next action

2. Step 2 > 3
Continue with the next action

3. Step 3 > 4
Continue with the next action

4. Step 4 > 5
Continue with the next action

Method exhibit: Risk, Characteristic, Check, Reaction, Revision.

Completed risk-to-station control record

Control-plan field	Completed teaching entry	Remaining authority
Characteristic	OP20 slot width;9.90-10.10 mm example	Current drawing/requirement
Method	Controlled width-measurement instruction	Measurement owner approves suitability
Sample	Proposed 5 consecutive every 50	Risk/containment review required
Record	Actual readings, identity, time, operator	Controlled station record
Reaction	Stop/hold/escalate; verify restart and disposition	Named quality/process roles

The characteristic changes revision

The product owner changes the slot requirement, but the station still displays the old control-plan copy.

Decision

Stop relying on the stale copy, identify affected work and route the change through controlled review of measurement, sampling, reaction and training.

Reasoning

Replacing a number alone may leave the method or response unsuitable. The linked documents and work conditions must change coherently.

What would change the decision?

The change record reconciles requirement, control plan and station instruction revisions.

See how the method works

Point-of-work control combines the check with the response. Before measuring, confirm the item identity, current instruction and suitable measurement method. Record the actual observation and its relevant context, not simply a reassuring tick. If the result is abnormal, follow the approved stop, containment and escalation path. Preserve the affected identities so later disposition can be justified. A supervisor's desire to resume output is not a replacement for authorized verification. Once the process is restored, confirm the required first acceptable evidence and document the decision. This lesson describes a management routine; it does not supply machine settings, interlock bypasses or an engineering controller design.

Method exhibit: Identify, Check, Record, Contain/escalate, Verify restart.

05 / Verify restart and disposition separately

Authorized personnel restore the process as required and verify restart conditions. Held material remains under its own disposition decision; Noor records the evidence and receiving role.

Why: Process readiness and product release can require different evidence. Closing the ticket before both responsibilities are clear would leave the control loop incomplete.

Evidence / check: The record distinguishes restart verification from held-product status.

Completed station abnormality record

Step	Completed entry	Decision
Check	10.13 mm vs 9.90-10.10 mm	Abnormal by .03 mm above upper criterion
Record	Identity/time/value retained	No replacement green tick
Exposure	Last reliable check to be established	Escalate signature-only evidence gap
Restart	Authorized verification required	No operator-invented adjustment
Held product	Separate quality disposition	No automatic release

A repeat reading is 10.08 mm

A later remeasurement produces 10.08 mm after the original 10.13 mm result.

Decision

Retain both observations and investigate the reason for disagreement under the approved measurement/response method. Do not delete 10.13 or release material solely from the later reading.

Reasoning

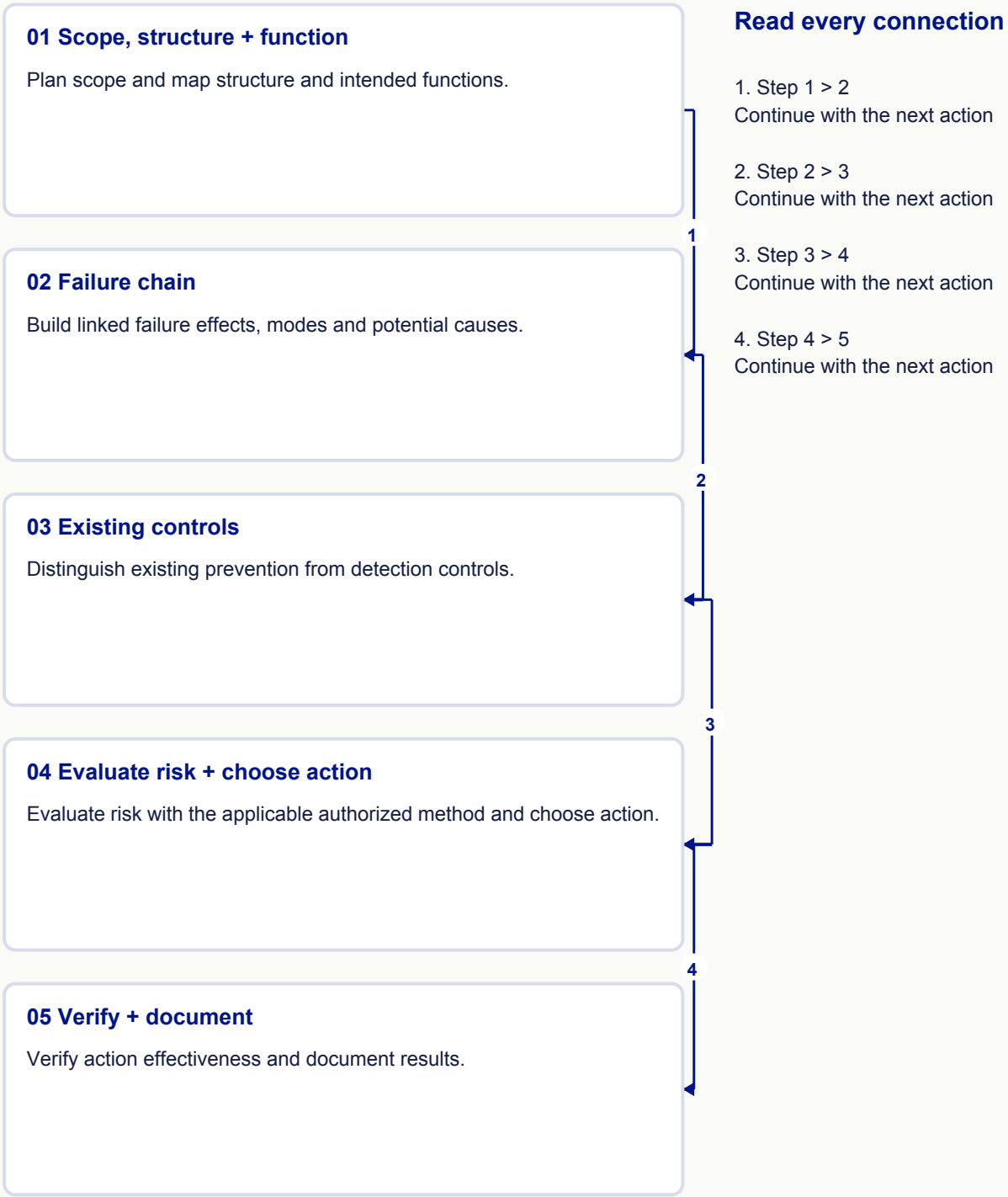
A discrepancy may involve measurement, location or process variation. Selecting the favorable value would conceal the evidence needed to decide.

What would change the decision?

The record links both readings to their conditions and responsible review.

See how the method works

Process FMEA considers how a process could fail before relying on failures to teach the lesson. Start with scope, structure and intended functions. Connect the failure effect, failure mode and potential cause at the appropriate levels. Keep prevention controls separate from detection controls: stopping the wrong selection differs from finding an under-tightened joint afterwards. Evaluate risk with the applicable authorized method, choose actions, verify their implementation and effectiveness, and document the results. The seven-step approach organizes that work; it is not a reason to invent ratings or reproduce proprietary tables. A predicted cause in risk analysis is also not proof of the cause of a past incident.



Method exhibit: Scope, structure + function, Failure chain, Existing controls, Evaluate risk + choose action, Verify + document.

Completed failure-chain action record

Risk-chain item	Proposed action/evidence	Status
Wrong-program cause	Review prevention of incorrect program identity	Proposed; not verified
Under-tightened mode	Review suitable detection of joint condition	Actual capability to establish
Lost-function effect	Retain relevant consequence in evaluation	Do not reduce by assertion
Action verification	Authorized challenge and retained result	Not yet performed
Connected control	Control plan and instruction revisions	Update after approved change

The proposed interlock is bypassable

During design review, the team finds a maintenance override that can bypass the proposed program check.

Decision

Include authorized override conditions, access and return-to-normal verification in the risk/action review before calling prevention effective.

Reasoning

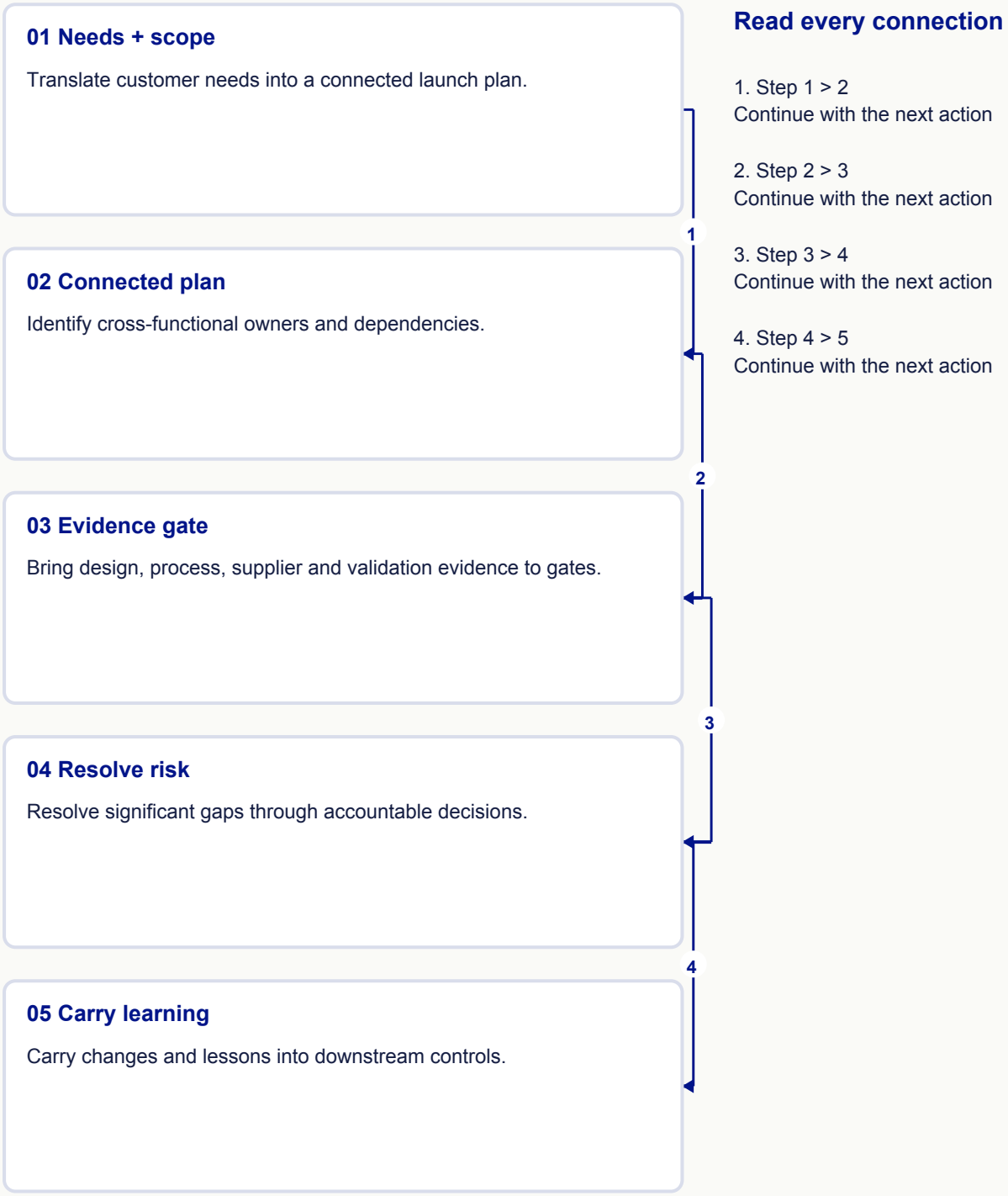
A control that works only in the normal demonstration may leave a relevant failure path open. Do not remove the path from the FMEA because it is inconvenient.

What would change the decision?

The verification plan includes the permitted override scenario and its responsibility.

See how the method works

APQP links product and process development to evidence-based launch decisions. Translate customer needs into a plan with connected responsibilities, timing and deliverables. Use gates to expose unresolved risks, dependencies and changes rather than to celebrate document completion. Evidence from design, process development, suppliers and validation must fit the actual scope. Carry decisions and lessons forward so an approved change does not leave downstream records obsolete. The current public AIAG materials distinguish APQP third edition from the standalone Control Plan first edition. Customer adoption and requirements still need checking. This teaching map demonstrates decision discipline, not a complete mandated gate list or automatic launch authorization.



Method exhibit: Needs + scope, Connected plan, Evidence gate, Resolve risk, Carry learning.

05 / Carry changes into operating controls

Validated changes flow into PFMEA, control plan, instructions, supplier controls and handover as applicable. The team verifies that the receiving operation can use them.

Why: A launch gate is connected to continuing control, not a ceremony that ends at shipment. Lessons and unresolved risks must reach the people doing the work.

Evidence / check: The handover identifies controlled revisions and receiving owners.

Completed launch-gap decision record

Gap	Required evidence	Gate disposition in this example
Measurement	Reviewed fitness/study evidence	Open; dependent claims qualified
Supplier	Validation under applicable input conditions	Open; owner and next review named
Reaction	Observed drill with corrected gaps	Open; not replaced by attendance
Overall	Authorized criteria-based decision	No automatic launch from percentage

The design changes after validation

A late revision changes a controlled characteristic after the trial evidence was accepted.

Decision

Assess which evidence and controls the revision affects, reopen those dependencies and obtain the required review before using the old acceptance for the new scope.

Reasoning

Prior evidence may remain useful, but applicability must be justified. Relabelling an old report with the new revision would break provenance.

What would change the decision?

A change-impact record identifies reused evidence, necessary revalidation and authority.

See how the method works

PPAP concerns evidence that the production process can consistently meet the relevant design and specification requirements under actual production conditions. Determine the customer's submission and change requirements before assembling the package. Link the evidence to the correct part, revision, process and production conditions. Submission, review and authorization are distinct states; possessing records is not the same as having approval. Preserve the decision and any conditions so the shop floor cannot silently treat an unresolved status as permission to ship. The workflow shown here is an original overview, not a complete PPAP element list, a submission level or a substitute for customer-specific instructions.

Read every connection

1. Step 1 > 2
Continue with the next action

2. Step 2 > 3
Continue with the next action

3. Step 3 > 4
Continue with the next action

4. Step 4 > 5
Continue with the next action

Method exhibit: Requirements, Part + revision, Production evidence, Submission + decision, Retained status.

04 / Track the actual customer decision

The submission receipt is recorded as receipt only. Ana retrieves the applicable customer decision and any conditions through the authorized channel; absence of a decision is not interpreted as approval.

Why: Submission, review and authorization are different states. An older decision cannot silently extend to a changed product or process.

Evidence / check: Current status remains decision pending in this fictional record.

05 / Retain conditions and manage later changes

After an actual authorized decision, the team retains its identity, scope and conditions and monitors relevant changes through the customer requirements. Operational instructions reference the correct status.

Why: Approval is meaningful only for its defined scope. Subsequent changes may require notification or resubmission; the teaching example does not decide those obligations.

Evidence / check: The status record preserves the decision and identifies the change-review owner.

Completed submission-to-decision record

Question	Evidence available	Current conclusion
Correct part/process?	M42/C, P7 records	Identity documented
Package submitted?	Submission receipt	Yes, receipt only
Applicable decision?	Only old revision B decision	Current authorization not established
Next action	Customer-quality owner retrieves decision/requirements	Do not infer approval from folder completeness

A conditional decision arrives

The customer issues a decision with explicitly limited scope or conditions.

Decision

Retain the exact applicable conditions, make them visible to the receiving operation and follow the required process for closure or further authorization.

Reasoning

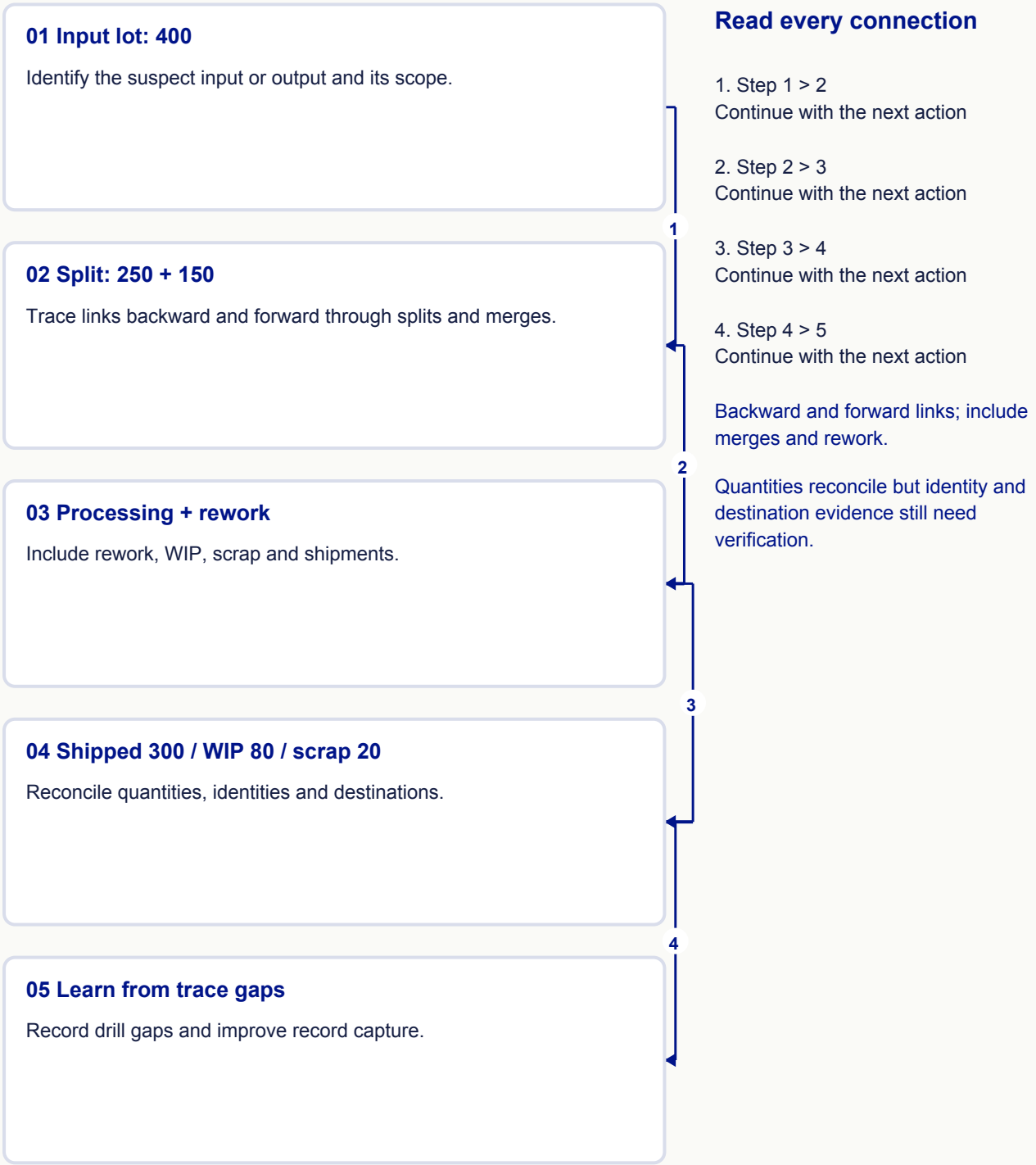
A conditional decision must not be relabelled unconditional approval for convenience. The actual authorized wording and scope govern.

What would change the decision?

The internal status links to the retained decision and its unresolved conditions.

See how the method works

Product traceability preserves identity through changes in material and work. A useful trace links inputs to outputs in both directions and follows splits, merges, rework and shipments. Start a drill with a clearly scoped suspect input or output, then collect the linked records and reconcile quantities and locations. A balanced total is necessary but not sufficient: records may still name the wrong destination or omit a rework link. Record gaps and improve the capture process before an actual containment event. The method supports locating affected product; it is distinct from metrological traceability, which concerns the reference chain and uncertainty of a measurement result.



Method exhibit: Input lot: 400, Split: 250 + 150, Processing + rework, Shipped 300 / WIP 80 / scrap 20, Learn from trace gaps.

05 / Resolve gaps before declaring completion

Luis reports the missing destination as unresolved, assigns the warehouse owner and preserves the balanced quantity evidence. Quality determines any required response using the actual scope.

Why: A truthful partial trace is more useful than a false complete label. Closure requires identity, destination and disposition evidence as well as arithmetic.

Evidence / check: The drill record states what is known, what remains uncertain and who resolves it.

Completed lot trace and gap record

Reconciliation	Arithmetic	Identity result
Path A	200+40+10=250	Verify every shipment/location link
Path B	100+40+10=150	One destination gap to resolve
Overall	300+80+20=400	Balanced, not yet a complete trace
Rework/merge	No quantity double-counting	Check actual genealogical links

A rework batch contains material from two lots

Path B material was merged with a second input lot during rework.

Decision

Trace the merged output identity and quantities for both inputs, and determine affected downstream scope through the authorized quality process.

Reasoning

A merge creates a relationship to retain, not permission to assign all output to one convenient original lot.

What would change the decision?

The record links both parent lots to the reworked output and its destinations.

See how the method works

A layered process audit checks execution of important controls through planned observation by defined roles. Choose specific questions tied to process risks, then decide how evidence is recorded and what happens when a control is absent or ineffective. The purpose is to detect and correct weaknesses in routine execution, not to substitute for product inspection or a full management-system audit. Review completion, findings, action effectiveness and recurring patterns as different measures. A high completion percentage can coexist with poor observations, and a low finding count can reflect superficial checks. Use learning to improve both the process and the audit questions without turning the routine into blame.

Read every connection

1. Step 1 > 2
Continue with the next action

2. Step 2 > 3
Continue with the next action

3. Step 3 > 4
Continue with the next action

4. Step 4 > 5
Continue with the next action

5. Step 5 > 1
Verify and repeat

Method exhibit: Critical-control questions, Roles + cadence, Observe evidence, Act + verify, Review effectiveness.

05 / Close through evidence of response

The owner handles immediate exposure, investigates why the identity step was missed and corrects the relevant process. A later observed opportunity checks whether the intended control now works.

Why: Sending a reminder is an action, not effectiveness evidence. The review must distinguish restoration now from prevention of the recurring gap.

Evidence / check: Closure references the later observation and any remaining system issue.

Completed layered-check response record

Record	Result	Decision
Completion	8/10=80%	Two planned checks remain unperformed
Finding rate	2/8=25%	Two findings among actual checks
Identity finding	Check absent at setup	Immediate response and exposure review
Effectiveness	Future observation required	Reminder alone does not close

All scheduled checks are signed on one afternoon

The log shows every leader completed the week's planned observations at the same quiet moment.

Decision

Review whether the planned operating opportunities were actually covered and correct the observation plan. Preserve the true timing rather than backdating entries.

Reasoning

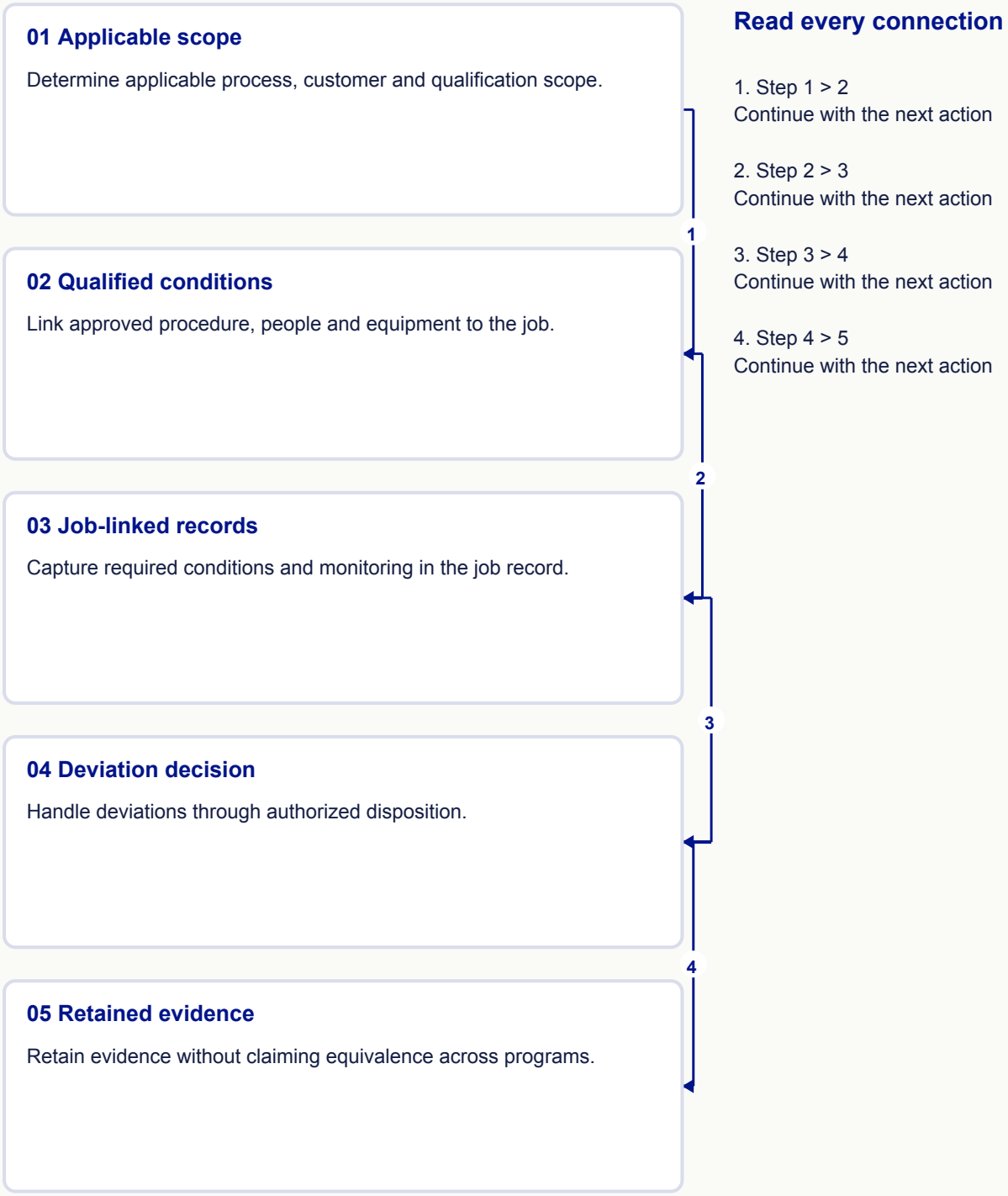
A perfect completion count can miss the conditions where a control is most likely to fail. The schedule should support representative observation.

What would change the decision?

The review records actual opportunities and gaps in coverage.

See how the method works

Special-process control links the job to qualified conditions and objective records. Determine the relevant process, customer and scope requirements before deciding which qualifications or assessments apply. Connect approved procedures, competent personnel, equipment status and required monitoring to the actual job identity. When conditions deviate, preserve the evidence and use the authorized disposition route instead of assuming final appearance proves acceptability. Automotive special-process assessments and aerospace Nadcap accreditation are distinct programs with their own applicability. This lesson teaches the evidence chain only. It deliberately provides no furnace recipe, chemical limit, welding parameter or claim that one generic checklist satisfies every special process.



Method exhibit: Applicable scope, Qualified conditions, Job-linked records, Deviation decision, Retained evidence.

04 / Route the deviation for authorized assessment

Responsible engineering and quality determine the necessary evidence, product status and disposition under the applicable requirements. Sam does not infer acceptance from appearance or invent a reprocessing recipe.

Why: Some process characteristics cannot be fully verified by later inspection alone. The correct response depends on the actual process and requirement authority.

Evidence / check: The deviation record names the decision owner and required technical review.

05 / Close and prevent the record mismatch

After an actual decision, the team retains its basis, corrects records through controlled amendments and addresses the revision-selection weakness. A subsequent job checks the improved linkage.

Why: A tidy folder is not enough; the underlying job-to-procedure-to-run relationship must be reliable. Closure distinguishes product disposition from the system action.

Evidence / check: The follow-up verifies a later job using the intended controlled revision.

Completed special-process evidence-gap record

Link	Evidence	Current decision
J204 > procedure	TravellerR 6 vs runR 5	Mismatch unresolved
Procedure > qualification	Applicable scope/resource status	Retrieve controlled evidence
Run > disposition	Authorized technical assessment	No appearance-based acceptance
System response	Revision-selection control	Verify on a later job

A valid accreditation covers another process

The supplier presents an accreditation record for a different commodity or site.

Decision

Verify the actual accredited scope and applicable customer requirement; do not treat the unrelated record as evidence for J204.

Reasoning

Qualification and accreditation are scope-specific. Similar branding or company ownership does not establish coverage.

What would change the decision?

The review identifies the mismatch and requests the correct scope evidence.

See how the method works

Nadcap readiness starts with the applicable scope and criteria, not with a universal binder template. Confirm the relevant process and site requirements using the current PRI and customer authorities. Perform the required preparation and self-audit with actual job evidence, identify gaps and verify corrective action. An optional pre-assessment can help preparation but is not the accreditation decision. The formal audit and subsequent review follow the authorized program process. Keep evidence linked to the criteria revision and the job being examined. This original preparation workflow does not prescribe an audit sample size, a universal checklist or assurance that accreditation will be granted.

Method exhibit: Scope, Current criteria, Self-audit + gap closure, Audit + review, Authorized decision.

Original readiness evidence index - fictional, not an official checklist

Scope / evidence	Current finding	Owner / closure evidence
East / C88 process	Scope defined for preparation	Quality lead: confirm applicable scope
Applicable criteria	Revision confirmation open	Quality lead: authorized source and revision
HT204 identity / process record	Located in controlled records	Process owner: confirm job linkage
HT204 instruction revision	G7 open; historical link missing	Document control + process owner: verified history
Pre-assessment	Booked; preparation only	No accreditation conclusion
Status claim	No East decision supplied	Verify actual authorized status and scope

A current document is offered as historical proof

Document control finds today's approved instruction but cannot show whether that revision applied when HT204 was processed. The folder is now complete by file count.

Decision

Keep G7 open, seek controlled revision/effectivity history and assess affected-job implications through the process owner. Do not reconstruct an unsupported signature or backdate a record.

Reasoning

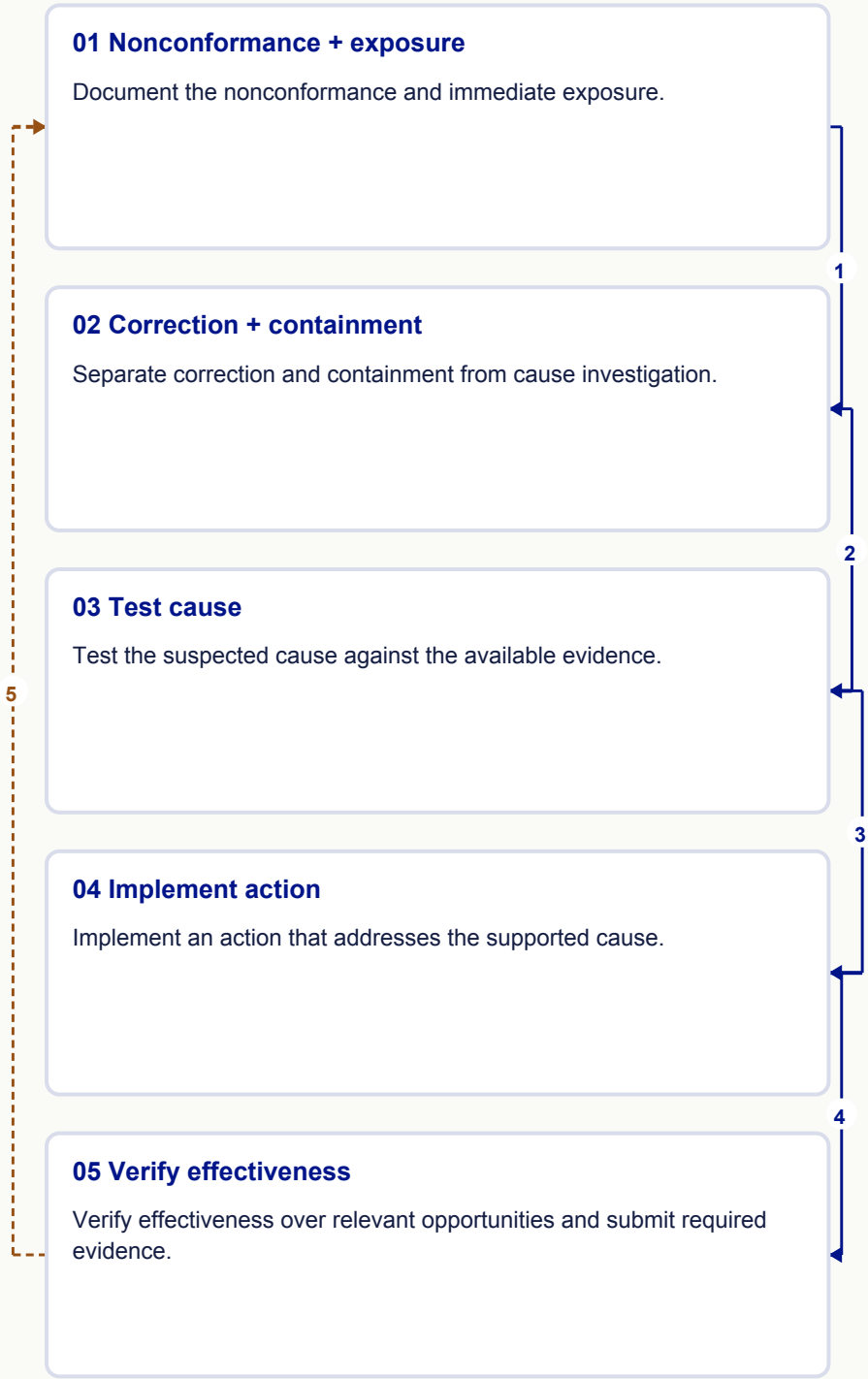
The missing fact concerns historical applicability, not whether a PDF exists. A file-count metric would close the wrong problem.

What would change the decision?

A defensible job/revision link or an explicitly managed unresolved condition is required; any product/customer response follows its actual authority.

See how the method works

An NCR response separates the detected problem from the system that allowed it. Correction addresses the instance; containment limits exposure while facts are established. For an overdue gauge, changing a label alone does not restore calibration. Follow the authorized process to remove it from use, complete required calibration and status verification, and assess affected measurement records. Investigate the scheduling cause, implement a supported system change and verify effectiveness over relevant opportunities for recurrence. Retain the records and required approvals. This is an original teaching structure, not an official response form or deadline, and effectiveness evidence cannot guarantee that recurrence is impossible.



Read every connection

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Continue with the next action

2. Step 2 > 3
Continue with the next action

3. Step 3 > 4
Continue with the next action

4. Step 4 > 5
Continue with the next action

5. Step 5 > 1
Verify and repeat

Method exhibit: Nonconformance + exposure, Correction + containment, Test cause, Implement action, Verify effectiveness.

04 / Implement an action addressing supported cause

If evidence confirms an unowned escalation path, the team assigns ownership, tests due-item visibility and defines how unresolved overdue status prevents use under the applicable system. The actual action follows the verified cause.

Why: An unrelated improvement or general retraining can leave the failure mechanism intact. Proposed controls must be distinguished from implemented and tested ones.

Evidence / check: The action record links the supported cause to a specific system change and owner.

05 / Verify over meaningful opportunities

Mina defines upcoming calibration due events and checks whether the new process identifies, escalates and resolves them before unauthorized use. She retains unsuccessful results and reassesses the action if needed.

Why: No recurrence during a period with no due events proves little. Effectiveness needs relevant opportunities, not merely elapsed days or a completed email.

Evidence / check: Closure evidence includes the opportunities observed and the limits of the conclusion.

Completed NCR response logic

Response part	Required evidence	Boundary / insufficient substitute
Containment	G18 removed; exposure identified	Does not settle past impact
Correction	Authorized calibration/status verification	Does not establish the cause
Cause/action	Supported scheduling weakness and implemented control	A generic reminder is insufficient
Effectiveness	Relevant due-event results	Elapsed time without opportunity is insufficient

Calibration finds an adverse condition

The authorized assessment finds a condition that may affect earlier measurements.

Decision

Use the applicable measurement/product-impact process to evaluate exposure and disposition, retaining the finding and decisions. Do not assume the scheduling fix resolves historical product risk.

Reasoning

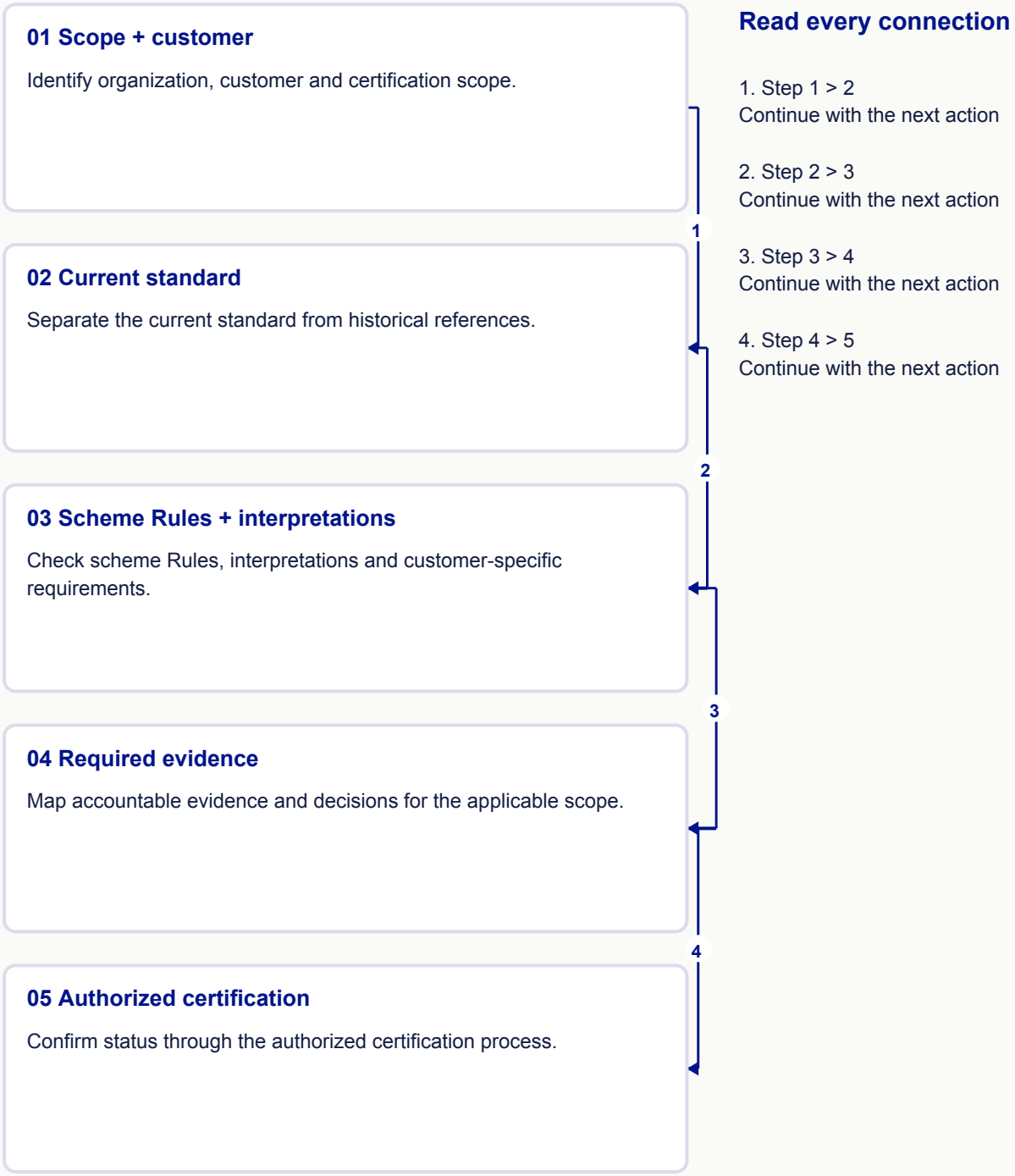
Current correction, past impact and recurrence prevention are connected but separate responsibilities.

What would change the decision?

The NCR links technical findings to the product-impact owner and retained decisions.

See how the method works

Begin by identifying the organization, product, customer and certification scope. IATF16949:2016 replaced the historical ISO/TS16949:2009 reference; certification Rules sixth edition are a separate document effective January2025. A July2026 IATF communiqué plans the second standard edition for mid2027 and explicitly treats timing as indicative. Do not treat that future edition as already published. Check current interpretations and customer-specific requirements alongside the applicable standard. Map responsibilities and evidence without claiming that a lesson, internal checklist or completed template establishes conformity. Certification status and scope depend on the authorized process; they cannot be inferred from familiarity with the terminology.



Method exhibit: Scope + customer, Current standard, Scheme Rules + interpretations, Required evidence, Authorized certification.

04 / Check supplements and customer conditions

He reviews current official interpretations/FAQs and applicable customer-specific requirements, recording revision and relevance rather than copying protected clauses into the training pack.

Why: The base standard title alone may not capture applicable current obligations. The organization needs access to the authorized documents and a controlled applicability process.

Evidence / check: Each additional requirement has a source, applicability decision and accountable owner.

05 / Treat revision plans as plans

Ren records the July 2026 communiqué's mid-2027 publication plan as indicative and schedules source monitoring. He does not claim the second edition is published or invent a transition deadline.

Why: A planned date is not an effective requirement. Current work follows applicable published authorities while preparing for verified future changes.

Evidence / check: The register separates published status, planned change and next review date.

Completed authority and applicability register

Question	Correct classification	Action
ISO/TS 16949:2009?	Historical replaced reference	Correct current lookup; retain history
IATF sixth edition?	Incorrect mixing of documents	Separate 2016 standard and Rules 6
Second edition available?	Planned, not published in checked sources	Monitor official update
Certified site?	Requires authorized scope/status evidence	Do not infer from this register

A customer request uses an ambiguous document name

The customer asks for "latest automotive certification rules" without specifying the intended deliverable.

Decision

Clarify the required authority and scope through the customer interface, provide the verified current references and avoid promising certification evidence that has not been checked.

Reasoning

Ambiguity should be resolved before turning a phrase into a compliance claim or internal requirement.

What would change the decision?

The clarification record identifies the customer's actual requirement and retained decision.

See how the method works

An engineering feedback loop measures a variable, compares it with a setpoint and uses a controller and actuator to influence the physical process. The sensor returns information so the loop can respond to disturbances. With the stated sign convention, error is setpoint minus measurement. That arithmetic does not specify the controller output: a real control law, dynamics and safety design determine the action. Statistical process monitoring asks a different question about patterns over time and sits outside this simplified fast loop. Do not interpret a control-chart signal as a recipe for tuning gains or bypassing equipment protections. This diagram explains roles, not a safe implementation for a particular machine.

No tuning values, operating recipe or safe machine command is provided.

04 / Separate SPC monitoring

The recorded sensor values can also feed a time-order statistical monitoring view outside the fast feedback path. That view can reveal longer-term behavior and prompt investigation through the process response.

Why: Statistical monitoring and engineering feedback serve different functions. A control-chart limit is not a controller setpoint, and a chart signal is not itself a tuning command.

Evidence / check: The diagram preserves a separate measurement-to-SPC branch.

05 / Describe a safe learning comparison

Kai proposes using a simulation or approved training system to show how a disturbance changes measurement and how an authorized controller responds. Real settings remain under qualified engineering control.

Why: Understanding the mechanism can be taught without providing unvalidated operating instructions. The lesson should develop reasoning about paths and authority.

Evidence / check: The next exercise labels simulated behavior and does not modify actual equipment.

Completed feedback-loop interpretation record

Question	Completed answer	Boundary
What is the error?	50−48=2 fictional units	Defined sign convention
What moves the process?	Actuator under controller command	Command not supplied
Where does disturbance enter?	Physical process	Not a specification change
Where is SPC?	Separate recorded-data monitoring	Not the fast control law

The sensor reading is suspect

The sensor reports 48, but an approved independent check indicates a measurement fault.

Decision

Escalate through the applicable instrumentation/process procedure and distinguish measurement validity from a real process deviation. Do not tune the controller to compensate for an unverified sensor problem.

Reasoning

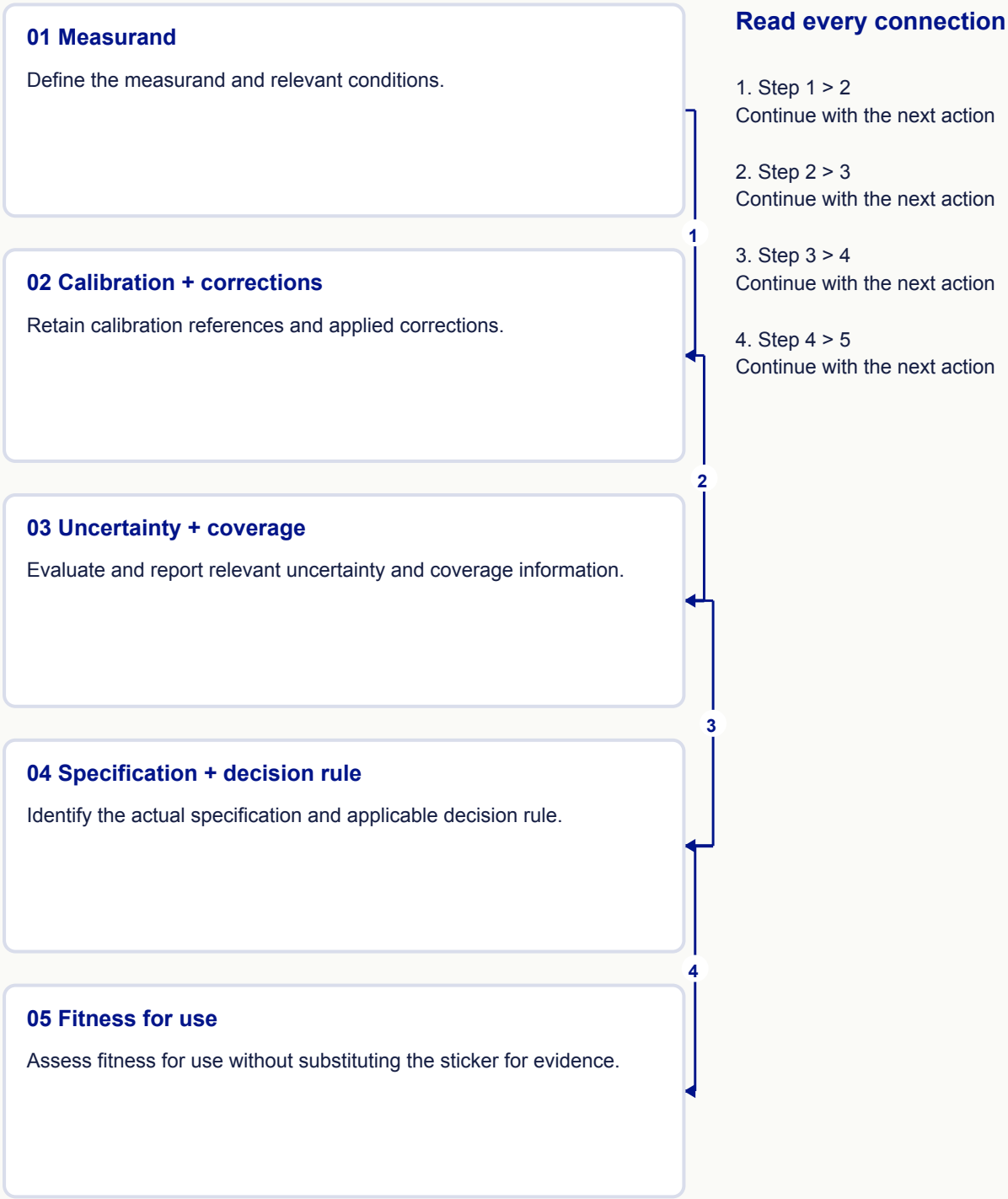
The loop acts on feedback; bad measurement can mislead both controller and monitoring. Repair authority and safe state depend on the actual system.

What would change the decision?

The evidence record marks sensor validity unresolved and names the qualified owner.

See how the method works

Metrological traceability is a property of a measurement result supported by a documented reference chain and associated uncertainty. A calibration sticker is a useful status cue, but it does not by itself establish that the reported result is fit for a particular decision. Define the measurand, conditions, corrections and relevant contributors to uncertainty. Preserve the calibration references and the information needed to interpret expanded uncertainty, including coverage information. Then use an appropriate decision rule for the actual specification and intended use. Measurement uncertainty is neither the product tolerance nor permission to widen it. Product-lot traceability is a different evidence chain with a different purpose.



Method exhibit: Measurand, Calibration + corrections, Uncertainty + coverage, Specification + decision rule, Fitness for use.

04 / Locate the actual conformity decision rule

She retrieves the approved specification and applicable decision rule before deciding acceptance. She does not add 0.020 to a limit as an improvised allowance.

Why: Conformity decisions must address measurement uncertainty under the applicable rule. A traceable result alone does not decide pass/fail.

Evidence / check: The decision record names specification authority, rule and authorized owner.

05 / Assess fitness and preserve the decision

Ada evaluates whether the measurement result and uncertainty are adequate for the intended use, resolves gaps and retains the resulting decision basis. If the method is unsuitable, she routes improvement or another authorized method.

Why: A documented chain can coexist with uncertainty too large for a particular decision. Evidence quality and acceptance authority remain connected but distinct.

Evidence / check: The retained record explains both measurement provenance and the actual decision.

Completed measurement-to-decision record

Question	Completed finding	Required next evidence
What is reported?	10.000 mm; expanded uncertainty .020 mm	Measurand/conditions
What interval arithmetic follows?	9.980-10.020 mm	Coverage information still needed
Is it traceable?	Sticker alone insufficient	Documented chain and corrections
Does it pass?	Not established	Specification and applicable decision rule

The gauge was calibrated after the measurement

The available certificate is current today but was issued after the reported result was produced.

Decision

Establish the status and applicable evidence at the measurement time, including any relevant before/after findings and authorized impact review. Do not silently backdate the newer status.

Reasoning

A later calibration can inform assessment, but it does not automatically prove the earlier measurement conditions or suitability.

What would change the decision?

The record distinguishes measurement date, calibration evidence and the responsible impact decision.